CLASS 333, WAVE TRANSMISSION LINES AND NETWORKS

SECTION I - CLASS DEFINITION

A. GENERAL STATEMENT OF THE CLASS SUBJECT MATTER

1. This class includes electric wave transmission systems wherein electromagnetic wave energy is guided or constrained by a wave transmission device of the long line type other than loaded lines.

2. Included are passive wave transmission networks simulating the characteristics of a long line wave transmission systems or wave guides, such as artificial lines, delay networks, resonators, impedance matching networks, equalizers, wave filters and transmission line terminations.

3. Also included are passive coupling networks and terminating networks having either lumped or distributed electrical circuit parameters and having impedance characteristics peculiarly adapted for use with the wave transmission systems of paragraph 1, above, or which are designed to be frequency responsive, or which are designed to be effective over or within a range of frequencies, for example, impedance matching networks, hybrid networks, coupling networks, wave shaping networks, phase shifting networks, wave filters, equalizers and attenuators.

4. Smoothing type wave filters having shunt capacitance, or series inductance, or both, usually designed to pass direct current and to reduce the effect of any undesired alternating or pulsating current superimposed on the direct current, or to pass direct current and low frequency alternating current or pulsating current and to reduce the effect of an undesired higher frequency alternating or pulsating current.

5. Networks including a wave transmission device and means for decreasing the amplitude range of the signal applied to the transmission device as the signal increases in amplitude and means for increasing or restoring the amplitude range of the signal after the transmission over the transmission device (i.e., companders).

6. Passive networks for producing an output wave which is the time derivative or time integral of the input wave (i.e., differentiating or integrating systems).

7. Systems including active elements for producing across at least two of the system terminals a negative resistance, and/or an inductance, or capacitance which may be positive or negative.

8. Wave traps using long line elements.

9. Transmission systems including only one or more of the systems or networks defined in paragraphs 1 - 8, above, and such systems in combination with current or voltage magnitude control means of the passive type. Systems including two or more of the networks or systems defined in paragraphs 1 - 8, above, are classified as set forth in the Class Definition, subsection C, below.

10. Components and elements not constituting a complete system or network limited by claimed structure to use in the systems or network of paragraph 1, above, and not otherwise classified, and also long line elements.

B. ACTIVE NETWORK

The systems classified in this class ordinarily contain no active elements, the only exceptions being the amplitude compression and expansion systems (companders) and negative resistance and/or reactance networks of the active element type found in this class. See Subclass References to the Current Class, below.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

SYSTEM AND NETWORKS INCLUDING TWO OR MORE OF THE NETWORKS AS DEFINED IN 1 - 8 OF THE CLASS DEFINITION

Such systems and networks which include two or more of the networks or systems so that each has its own function, and one is not merely part of the other, are classified in the first occurring subclass and cross-referenced to the later occurring subclass or subclasses. For instance, a filter (subclasses 167+) combined with a wave shaper (subclass 20) is classified in subclass 20 and cross-referenced to subclasses 167+. Where the combinations of the plural networks are useful as a third device having its own function provided for in the schedule, the patent is classified in the subclass providing for the third device. For example, the combination of a resonator (subclasses 219+) and a long line (subclasses 236+) which results in an interference elimination device (subclass 12) would be classified in subclass 12 and cross-referenced to subclasses 219+ and 236+ for novel resonator or long line structure if necessary.

Where one of the networks is only a part of another network, the patent is classified on the basis of the combination and cross-referenced if necessary for the part. For example, a filter (subclasses 167+) including a long line element with impedance matching (subclass 32) where the over-all function of the network is filtering and not impedance matching, is classified in subclasses 202+ and cross-referenced to subclasses 33+ if necessary.

NETWORKS AND SYSTEMS WITH SPECIFIC SOURCE OF INPUT ENERGY

This class does not provide for the subject matter of the class (Class Definition paragraphs 1-10 above) in combination with a specific source of electromagnetic wave energy, such as a microphone, which limits the system to use with a particular art even though the source is recited by name only. However, this class will take the systems and networks of the class in combination with a source of wave energy which is recited by its characteristics; for example, as being composed of a band of frequencies with only odd harmonics, or where the source is recited only as a general class of wave energy generators, such as an oscillator, etc., where the specific characteristics and details of the source are recited, such as specific oscillator system details, the system or network is classified with the specific source.

NETWORKS AND SYSTEMS WITH SPECIFIC LOADS IN THE OUTPUT CIRCUIT

This class does not provide for the subject matter of the class (Class Definition, paragraphs 1 to 10 above) in combination with a specific load device supplied with energy by the system or network, even though the load device is recited by name only (as a motor, loudspeaker, piezoelectric crystal, etc.). Such systems and networks are classified with the art which provides for the systems of supply for the specific load device.

SYSTEMS AND NETWORKS AND COMPONENTS IN OTHER CLASSES GENERIC TO THE SUBJECT MATTER OF THIS CLASS

See References to Other Classes below.

WAVE TRANSMISSION LINE AND NET WORKS ANALOGOUS TO THOSE IN THIS CLASS, BUT WHICH ARE CLASSIFIED ELSEWHERE

See References to Other Classes.

TESTING AND MEASURING SYSTEMS FOR WAVE TRANSMISSION LINES AND NETWORKS

This class (333) will take systems for determining the electrical wave propagation characteristics of transmission lines and networks falling within the class definition, provided that significant details of the transmission line or network are claimed. That is, merely claiming the line or network by name only (e.g., as a transmission line, coupling network or resonator) or characterizing it as a four terminal or two terminal impedance network would not be sufficient basis for classification in this class, classification would then be in one of the classes indicated below, depending on the nature of the test or measurement.

1. Long Telephone Lines:

Systems and apparatus for testing long telephone lines to determine impedance irregularities, unbalance in loaded lines, impedance versus frequency characteristics, impedance versus delay characteristics, or other long telephone line characteristics are classified elsewhere. See References to Other Classes, below

2. Power, Voltage and/or Current Determination in Wave Transmission Lines or Networks:

Apparatus for measuring the voltage or current, or the voltage or current standing wave ratio, or power dissipation in wave transmission lines are classified in elsewhere. See References to Other Classes, below

3. Impedance Characteristic of Networks or Network Elements:

Systems for determining the inductance, capacitance or resistance, or any of these properties over a range of frequencies, of four-terminal or two-terminal impedance networks in general are classified in elsewhere. See References to Other Classes, below

4. Wave Frequency Determination Systems:

Wave frequency determination systems having means giving a direct quantitative indication of the frequency of electrical currents are classified elsewhere. See References to Other Classes, below.

Frequency meters which measure frequency by utilizing phase shift networks are classified elsewhere. See References to Other Classes.

5. Wave Meters:

Wave Meters for determining the wave length of electrical waves are classified elsewhere.

6. Electromagnetic Radiation Field Strength Measurement:

Apparatus for measuring electromagnetic radiation field strength is classified elsewhere. See References to Other Classes.

7. Wave Analyzing Systems:

Devices for determining the individual frequency components of a complex electric wave, and such devices which also determine the amplitude or relative phase positions of the different frequency components of the complex wave are classified elsewhere. See References to Other Classes.

Speech wave analyzing devices are classified elsewhere. See References to Other Classes.

CONDUCTOR STRUCTURE, ARRANGEMENTS AND COMPONENTS

See References to Other Classes below..

SYSTEMS UTILIZING WAVE TRANSMISSION LINES AND NETWORKS

See References to Other Classes.

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for plural channel systems wherein passive means, such as wave filters, are employed to separate plural messages or signals.

14, for amplitude compression and expansion systems (companders).

213+, for negative resistance and/or reactance networks of the active element type.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

84, Music, subclass 661, 699 or 736 for electrical tone generating and music instruments with electric translating devices including coupling networks or wave filters. (See Lines With Other Classes, “Systems Utilizing Wave Transmission Lines and Networks)

138, Pipes and Tubular Conduits, appropriate subclasses for conduits (including wave guides) and conduit and pipe accessories disclosed for electrical use even though the conduit is made of or lined with metal or insulating material unless there is claimed some structure or feature which limits the same to electrical use in addition to mere pipe or conduit structure. (See Lines With Other Classes, “Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class”)

138, Pipes and Tubular Conduits, provides for conduit and pipe structure and accessories. See Lines With Other Classes, “Systems and Networks and Components in Other Classes, Generic to the Subject Matter of This Class (and related class references) above. (See Lines With Other Classes, “Conductor Structure, Arrangements and Components”)

174, Electricity: Conductors and Insulators, appropriate subclasses for housings, conductor and conduit structure and for conductor and conduit joint and end structure which include electrical features and which are not defined as having long line characteristics, and subclasses 137+ for insulator structures. See subclasses 32+ for conductor arrangements and structures for preventing or reducing the detrimental effects due to either the self-inductance of a single conductor or mutual inductance between plural conductors, subclasses 27 and 113+ for parallel or twisted conductor structure, subclasses 28+ and 102+ for coaxial and shielded cable structure, subclasses 37+ for underground conductor structure, subclasses 38, 43, 49, and 71+ for branched electrical conductor structure, and subclasses 40+ for overhead conductor structure. (See Lines With Other Classes, “Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class”)

174, Electricity: Conductors and Insulators, provides for conductor structure, insulator structure and transmission accessories (e.g., boxes,

shields, housing). (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

178, Telegraphy, subclass 45 provides for loaded lines and all systems and networks analogous to the systems or networks in this class (333) which include loaded lines. Subclasses 69+ includes patents relating to line clearing, circuit maintenance and anti-inductive lines analogous to similar systems in subclass 12 of Class 333. (See Lines With Other Classes, "Wave Transmission Line and Net Works Analogous to Those in This Class, etc.")

178, Telegraphy, subclass 46 provides for loading coils for use with loaded lines. (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

178, Telegraphy, for telegraph systems utilizing wave transmission lines and networks, especially subclass 43, for space induction radiation systems, subclasses 45+ for loaded transmission line systems; subclass 49 for systems wherein currents (signaling or otherwise) and telegraph signal currents are superposed on the same transmission path, subclass 63 for cable systems including means for correcting for telegraph signal distortion caused by cable capacitance; subclass 64 for wave transmission line systems including mutual induction type coupling networks or transformers; subclasses 66.1+ for alternating current systems, other than harmonic or vibrating reed systems (for which see subclass 47); subclasses 66.1+ for pulsating current systems; and subclass 69 for telegraph systems wherein wave transmission networks are utilized to correct for the deleterious effects of line charges and surges which may cause signal distortion. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

191, Electricity: Transmission to Vehicles, subclasses 2+ for electrical transmission line systems and coupling means for transmitting electric current between relatively movable source and load and subclass 10 for systems wherein the transmission of energy between the relatively movable source and load is effected through an induction field coupling means. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

200, Electricity: Circuit Makers and Breakers, appropriate subclasses for electric switches of general utility and not limited by claimed structure to use with long lines. (See Lines With Other Classes, "Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class")

200, Electricity: Circuit Makers and Breakers, provides for electric switches (See Lines With Other Classes, "Systems and Networks and Components in Other Classes, Generic to the Subject Matter of This Class (and related class references) above). (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

219, Electric Heating, wherein wave transmission lines or coupling networks are employed in electrical heating systems. Note subclasses 600+ for inductive heating, subclasses 678+ for microwave heating, and subclasses 764+ for capacitive dielectric heating, subclasses 50+, especially subclasses 108+ and 130.1+ for metal heating systems, and subclasses 482+ for electrical heating systems in general. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

246, Railway Switches and Signals, for wave transmission networks that may be employed in railway electric signaling and control, especially subclasses 7+ for train telegraphy and telephony used for train dispatching, subclass 30 for automatic block signal systems controlled by hertzian waves, subclass 61 for automatic block signal systems wherein the signal and propulsion currents are superimposed, subclass 63 for cab signal or train control systems wherein signals or control currents are transferred between the train and the transmission line by induction and subclasses 72, 81+ for systems wherein the signaling energy is derived from the propulsion current. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

250, Radiant Energy, subclass 250 and in Class 324, Electricity: Measuring and Testing, subclasses 76.39+, especially subclasses 76.41+ and 76.51, for determining the wave length of electrical waves.

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 661 through 664 . (See Lines With Other Classes, "Conductor Structure and Within This Class, Arrangements and Components")

307, Electrical Transmission or Interconnection Systems, for miscellaneous transmission or interconnection systems not otherwise classified. For example, Class 307 provides for sub-

ject matter similar to that classified in Class 323 where there are plural input circuits and/or plural output circuits. Class 307 also provides for some systems which include one or more long line elements where the system includes an active element so that the system is excluded from Class 333. See the pulse forming and wave shaping in subclasses 106+ for example. Class 307 is also the miscellaneous class for anti-inductive systems (see subclasses 89+). (See Lines With Other Classes, "Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class")

307, Electrical Transmission or Interconnection Systems, subclasses 147+ is the miscellaneous subclass for conductor arrangements or structure. (See Lines With Other Classes, "Systems and Networks and Components in Other Classes, Generic to the Subject Matter of This Class (and related class references) above). (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

307, Electrical Transmission or Interconnection Systems, is the generic place for electrical energy distributing and/or controlling and/or generating systems for which provision is not made in any other electrical system class. By way of example, provision is made for subclasses 1+ for systems with superimposed unlike currents, subclasses 11+ for plural load systems, subclasses 43+ for plural supply circuits or sources, subclasses 401+ for semiconductor (i.e., transistor) electric or transductor system, subclasses 89+ for anti-induction or coupling to other systems, subclasses 326+ for self protective, safety or limit control systems, subclasses 98+ for combined impedance and switch systems, subclass 103 for line drop compensation, subclass 104 for electromagnet or highly inductive systems, subclass 105 for harmonic filtering or neutralizing systems, subclasses 106+ for wave form, wave shaping or pulse producing systems, subclasses 112+ for switching systems, subclasses 147+ for conductor arrangements or structure, and subclasses 149+ for miscellaneous systems. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

315, Electric Lamp and Discharge Devices: Systems, particularly subclasses 4+ for cathode-ray tubes having long line elements or resonators structurally combined therewith, subclass 39 for a space discharge device structurally combined with wave guide, coaxial cable or resonant parallel wire transmission line, and subclass 40 for space discharge devices with an electrode formed as an inductive impedance (e.g., magnetron). (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

323, Electricity: Power Supply or Regulation Systems, provides for miscellaneous transformer systems in subclass 355 and for miscellaneous impedance systems in subclass 364, where the system or network has only a single input and a single output. Class 323 also provides for the miscellaneous systems for controlling the magnitude of the current and/or the voltage and/or for controlling the phase in systems and networks having only a single input and a single output circuit where the same current is in the output as is in the input. (See Lines With Other Classes, "Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class")

323, Electricity: Power Supply or Regulation Systems, subclass 355 provides for the miscellaneous structural arrangement of a transformer and other electrical devices which are connected together, and subclass 364 provides for the miscellaneous structural arrangements of impedance elements, which are connected together to form a network. (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

324, Electricity: Measuring and Testing, for electrical testing systems utilizing wave transmission networks or for measuring impedance characteristics of electrical networks in general, subclass 72, 95, 140+, and 612+ for electric power, current and/or voltage measuring systems for systems employing wave transmission lines or networks for determining reflected power or standing wave amplitude ratios and subclasses 76.77+ for electric phase angle measuring systems including electric wave transmission lines or networks used for time delay or coupling purposes. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

324, Electricity: Measuring and Testing, subclasses 600+ for Systems for determining the inductance, capacitance or resistance, or any of these properties over a range of frequencies, of four-terminal or two-terminal impedance networks in general; subclasses 76.77+ for phase shift or phase relations between voltages or

currents or voltage and current in electrical systems in general.

324, Electricity: Measuring and Testing, subclasses 76.12+ and 76.39+ for means giving a direct quantitative indication of the frequency of electrical currents .

324, Electricity: Measuring and Testing, subclasses 76.52+ for frequency meters which measure frequency by utilizing phase shift networks.

324, Electricity: Measuring and Testing, subclasses 76.11+, for apparatus for measuring electromagnetic radiation field strength.

324, Electricity: Measuring and Testing, subclasses 76.12+, for devices for determining the individual frequency components of a complex electric wave, and such devices which also determine the amplitude or relative phase positions of the different frequency components of the complex wave.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous nonlinear circuits which may utilize an active device such as a transistor or electron tube. (See Lines With Other Classes, "Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class")

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous circuits which may incorporate a transmission line device. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

329, Demodulators, subclass 322 and 354+ for a demodulator with distributed electrical parameters. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

330, Amplifiers, appropriate subclasses, for one way amplifiers utilizing wave transmission networks or filters for input, output, or interstage coupling, particularly subclasses 53+, 116, 117, 120+, 122, 157+, 185+, and 192+. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

331, Oscillators, for oscillation generators utilizing wave transmission lines and networks as elements thereof, particularly subclass 5, 6+, 9, 79+, 86+, 93, and 96+ for oscillator systems employing distributed parameter networks or resonators, subclasses 110 and 138+ for oscillators employing bridge networks, subclasses 86+, 115, 126+, and 132+ for oscillators of the negative resistance type, subclass 135+ for oscillators employing phase shift networks, subclasses 74+ for oscillators combined with a particular output coupling network and subclasses 73, 116, 139, and 154+ for oscillators employing an electromechanical resonator. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

332, Modulators, for modulation systems utilizing wave coupling networks, long line sections or negative impedance devices as elements thereof, particularly subclasses 129+ and 138+ under frequency modulators and subclasses 163+, 175 and 176+ under amplitude modulators. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

334, Tuners, provides for tuners which are closely analogous to the wave filters in this class. The tuners usually have inductance and capacitance elements of the lumped type together with means to vary either the inductance or capacitance element or both in order to change the mean resonant frequency of the tuner. The tuners in Class 334 may include one or more long line elements in addition to a lumped inductor or capacitor; or the tuner may consist of a distributed parameter type tuning unit which is adjusted in discrete, distinct steps; or where two or more distributed parameter type tuning units are ganged together either mechanically and/or electrically so as to have their mean resonant frequency adjusted in unison. Where only the band width of a filter is varied without varying the mean resonant frequency, classification is in this class (333). (See Lines With Other Classes, "Wave Transmission Line and Networks Analogous to Those in This Class, etc.", "Systems and Networks and Components in Other Classes, Generic to the Subject Matter of This Class"; "Conductor Structure, Arrangements and Components")

334, Tuners, appropriate subclasses for tuned networks for use in wave energy apparatus and comprising inductance and capacitance elements in circuit arrangement to form a resonant circuit and in which structure is provided for adjusting one or both of these elements for changing the mean resonant frequency of the circuit. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

336, Inductor Devices, appropriate subclasses for transformers and inductors which are not designed to be frequency responsive (e.g., not having points of resonance within the range of frequencies over which the device is designed to operate). (See Lines With Other Classes, "Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class; and "Conductor Structure, Arrangements and Components")

338, Electrical Resistors, appropriate subclasses, for fixed and variable electric resistors, per se. See (2) Note under Class 333, subclass 22, for the distinction between the resistors in Class 338 and the dissipating terminals for long lines. (See Lines With Other Classes, "Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class)

338, Electrical Resistors, provides for fixed and variable resistors. (See Lines With Other Classes, "Systems and Networks and Components in Other Classes, Generic to the Subject Matter of This Class (and related class references) above). (See Lines With Other Classes, "Conductor Structure, Arrangements and Components)

340, Communications: Electrical, for electrical communication systems in general having wave transmission lines and networks as elements thereof, particularly subclasses 825.37+ for party line type selective systems, subclasses 825.57+ for pulse responsive selective systems, subclass 825.70 for phase responsive selective systems, subclasses 825.71+ for frequency responsive selective systems, subclasses 825.77+ for amplitude responsive systems, subclasses 870.01+ continuously variable indication systems (e.g., telemetering), subclasses 286+ for miscellaneous signaling systems, and subclasses 310.01+ for composite signaling systems (e.g., signal over power line).

343, Communications: Radio Wave, for radio wave energy systems which employ wave transmission lines and networks as elements thereof, subclasses 5+ for reflected or returned wave systems, (e.g., object detection radar), subclasses 350+ for directive systems (including polarization), subclasses 700+ for antennas involving wave transmission lines and networks including long line sections, usually resonant, designed to act as space radiators or collectors of electromagnetic waves. See (11) Note under subclass 700 of Class 343 for classification lines between coupling networks and antennas with such coupling networks. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

360, Dynamic Magnetic Information Storage or Retrieval, for magnetic recorders or reproducers having wave transmission networks as elements thereof. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

361, Electricity: Electrical Systems and Devices, subclasses 271+ for capacitors, subclasses 600+ for miscellaneous arrangements for mounting two or more different circuit elements which are not in circuit arrangement (including printed circuits), and subclasses 503+ for electrolytic capacitors. (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

361, Electricity: Electrical Systems and Devices, subclasses 107+ for wave transmission networks for use in surge suppression circuits, and subclasses 117+ for lightning arresters. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

363, Electric Power Conversion Systems, particularly subclasses 2+, 9+ and 36 for phase conversion systems (e.g., m-phase to n-phase) combined with other types of conversion, subclasses 39+ for current conversion systems combined with means to eliminate undesired frequency components (e.g., filter), and subclasses 148+ for phase conversion systems, per se. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

364, Electrical Computers and Data Processing Systems, appropriate subclasses, (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks)

365, Static Information Storage and Retrieval, appropriate subclass for read/write static storage systems, particularly subclass 194, 198, and 223 which include delay, transmission, and bridge means for a read/write circuit. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

367, Communication, Electrical: Acoustic Wave Systems and Devices, subclasses 197+ for selective systems which are sound responsive. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

370, Multiplex Communications, appropriate subclasses for multiplexing systems, particularly subclass 272 for a sextuplex system, subclasses 273+ for a quadruplex system, subclasses 276+ for a duplex system, and subclass 297 for a diplex system. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Networks")

379, Telephonic Communications, subclasses 22+ for systems and apparatus for testing long telephone lines to determine impedance irregularities, unbalance in loaded lines, impedance versus frequency characteristics, impedance versus delay characteristics, or other long telephone line characteristics.

379, Telephonic Communications, subclass 398 includes loaded line systems and anti-inductive systems analogous to the subject matter of this class (333). (See Lines With Other Classes, "Wave Transmission Line and Net Works Analogous to Those in This Class, etc.")

379, Telephonic Communications, subclasses 443+ provides for telephone induction coils. (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

379, Telephony, appropriate subclasses, especially subclasses 90+ for composite systems, employing wave transmission networks wherein voice signal systems are combined with other electrical systems, such as telegraph, power or lighting systems (Note that this class (333) provides for plural channel systems wherein passive means, such as wave filters, are employed to separate plural messages or signals. (See Subclass References to the Current Class, above)); subclass 78 for wave transmission networks used to compensate for or prevent detrimental effects on telephone systems of internal or external induction or radiation fields; subclass 79 for such systems under subclass 78, utilizing capacitive reactance for compensation and subclass 80, under subclass 78, wherein the compensation means comprises impedance coils; subclass 81, for telephone substation circuits employing wave coupling networks of the conjugate or Whetstone bridge type and/or balancing networks; subclass 82 for space induction radiation systems having wave transmission networks as elements thereof, subclasses 170+ for telephone repeaters (i.e., two-way amplifiers) utilizing hybrid networks and line balancing networks; subclasses 172+ for coupling devices of the induction coil type associated with telephone instruments; subclass 174 for anti-induction devices including wave transmission networks for preventing the undesirable effects of induction in telephone systems or instruments, other than those anti-induction devices in subscribers circuits, for which see subclasses 78+, 81; and subclass 175 for testing devices utilizing wave transmission networks for telephone systems or devices, not particularly subclasses 175.3+ under subclass 175 for testing long telephone lines and associated apparatus.

439, Electrical Connectors, provides for miscellaneous connector structure (see subclasses 55+ for preformed or printed circuit arrangements involving only conductors and connector structure). (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

455, Telecommunications, appropriate subclasses for filters analogous to those in this class and forming an element of radio communication systems. (See Lines With Other Classes, "Wave Transmission Line and Net Works Analogous to Those in This Class, etc.")

455, Telecommunications, subclasses 334+ for miscellaneous circuitry and apparatus which are specialized to use with radio apparatus. (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

455, Telecommunications, appropriate subclasses for modulated carrier communication and radiotelephone communication systems, which may include coupling and filtering means.

505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature (T_c 30 K) superconducting devices, and particularly subclasses 210+ for transmission line and networks, electrical energy storage devices, magnetic coils, wires, cable, etc. (See Lines With Other Classes, "Systems and Networks and Components in Other Classes Generic to the Subject Matter of This Class")

505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature (T_c 30 K) superconducting devices, and particularly subclasses 210+ for transmission line and networks, electrical energy storage devices, magnetic coils, wires, cable, etc. (See Lines With Other Classes, "Wave Transmission Line and Net Works Analogous to Those in This Class, but Which Are Classified Elsewhere")

505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature (T_c 30 K) superconducting devices, and particularly subclasses 210+ for transmission line and networks, electrical energy storage devices, magnetic coils, wires, cable, etc. (See Lines With Other Classes, "Conductor Structure, Arrangements and Components")

505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature (T_c 30 K) superconducting devices, and particularly subclasses 210+ for transmission line and networks, electrical energy storage devices, magnetic coils, wires, cable, etc. (See Lines With Other Classes, "Systems Utilizing Wave Transmission Lines and Network"s)

703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclasses 13 through 22 for the simulation of electronic device or electrical system.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclasses 200+ , for speech wave analyzing devices.

708, Electrical Computers: Arithmetic Processing and Calculating, subclass 818 for correlation or convolution with tapped delay line, and subclass 819 for electrical analog filtering devices.

725, Interactive Video Distribution Systems, appropriate subclasses for cable television.

SECTION V - GLOSSARY

ACTIVE NETWORK

A network containing a source of energy, or a sink of energy (i.e., a device for absorbing or dissipating energy other than that accounted for by the resistance of the components of the networks). Merely dissipating the heat generated by a resistance will not cause the resistance to be an active element.

AMPLITUDE RANGE

The ratio of the highest amplitude to the lowest amplitude of an undulating wave.

AMPLITUDE RANGE COMPRESSOR

A nonlinear device having an input and an output, the amplitude range of the output wave being less than the amplitude range of the input wave.

AMPLITUDE RANGE EXPANDER

A nonlinear device having an input and an output, the amplitude range of the output wave being larger than the amplitude range of the input wave.

ARTIFICIAL LINES

Networks for simulating impedance characteristics of a smooth or loaded electrically long transmission line over a frequency range.

ATTENUATOR

Devices and networks consisting of one or more elements which exhibit only a positive resistance effect and which reduce the intensity of the energy passing through the device by dissipation, (a) the elements being proportioned to permit a change in their value to control the energy loss while maintaining substantially constant input and/or output impedance of the device, and/or (b) the elements being proportioned to permit the device to be inserted in the circuit to provide an energy loss without introducing any reflections in the circuit, and/or (c) the elements being combined with a long line or long line element, and/or (d) the device or network having an impedance equal to the impedance of a specified long line, and/or (e) the device or network is claimed as being particularly modified for use over a frequency band so that its characteristics are particularly related to frequency.

BALANCED CIRCUIT

A circuit having its conductors electrically symmetrical with respect to a reference potential plane (e.g., ground). The potentials between the two sides and ground are equal and of opposite sign. For example, a horizontal two wire line may be a balanced line.

CHARACTERISTIC IMPEDANCE

The impedance which a long line or a long line element would have if it were infinitely long. A long line which is terminated in its characteristic impedance is not resonant.

COMPANDER

An amplitude range compressor connected to an amplitude range expander with or without an intervening

transmission line so that the amplitude range of the input wave is first decreased in the compressor and then increased in the expander.

COUPLING NETWORKS

(a) Networks including significant reactive structure for effecting the transfer of oscillatory energy from one circuit to another circuit and having attenuation and/or delay characteristics over a frequency range for attenuating and/or delaying in a predetermined manner wave energy passing therethrough, and/or providing an impedance match between the network and at least one of the circuits; (b) smoothing type wave filters having shunt capacitance, or series inductance, or both usually designed to pass direct current and to reduce the effect of any undesired alternating or pulsating current, or to pass direct current and low frequency alternating current or pulsating current and to reduce the effect of any undesired higher frequency alternating or pulsating current.

DELAY

Includes phase distortion and also includes the retardation of a single pulse with respect to time.

DELAY NETWORK

Networks including significant structure for retarding wave energy a predetermined period of time over a range of frequencies.

DISSIPATING TERMINATIONS: (FOR LONG LINES)

Networks specialized for use with and designed for connection to the end of a long line transmission line and including a resistive component for dissipating the wave energy propagated along the line and presenting an essentially resistive impedance to the line.

DISTRIBUTED PARAMETERS

When the impedance of a transmission device or line at the operating frequency or band of frequencies is due primarily to the parameters of the device or line itself, and in considering the inductance, capacitance and resistance of the device or line they must be considered as mixed together and spread out along the device or line rather than being considered as in separate discrete lumps or devices as in the case of simple series and parallel circuits, the transmission device or line ay be said to have distributed parameters. Examples of circuits with distributed parameters include telephone, telegraph and power lines for high frequency energy.

EQUALIZER

Networks with attenuation or attenuation and phase distortion characteristics which vary over a frequency range for use in a wave transmission system for modifying the attenuation or attenuation and phase characteristics of the wave energy as a function of frequency.

FREQUENCY RESPONSIVE NETWORK

As the frequency of the applied energy changes over a band, the impedance of the network varies as a function of the frequency. Frequency responsive networks and devices are designed to obtain desired characteristics where a band of frequencies or different frequencies are involved.

HYBRID TYPE NETWORK

A network for coupling one wave transmission line to two or more wave transmission lines in such manner that there is a conjugate relation between at least two of these coupled transmission lines to prevent any interchange of energy between the conjugately related lines.

IMPEDANCE MATCHING NETWORK

Coupling networks which include one or more impedance elements construed or proportioned to substantially eliminate the reflected wave energy between the network and at least one of the connected circuits caused by impedance differences.

LOADED LINES

A long line to which lumped impedance elements, usually capacitors or inductors, are added at regularly spaced points along the length thereof, or to which an added impedance is applied in a continuous manner, as for example, by wrapping a strip of magnetic material about the line or device to increase the inductance of the line or device.

LONG LINE

A wave transmission device or line having distributed parameters and especially designed to propagate electrical wave energy where the wave length of the transmitted energy is relatively short when compared with the length of the transmission line or device. The impedance of a long line is practically fixed by the constants

of the line itself. The length of the transmission line or device may be a multiple or a fraction of a wave length, e.g., 1/4, 1/2, etc., or otherwise have its length proportioned to the wave length of the energy with which it is to be used.

LONG LINE ELEMENT

A circuit element having distributed parameters, such as a resonator, or a wave guide. A long line element may be a part of a long line wave transmission device or used in a network with other circuit elements of the lumped parameter type, for example, as in the case of delay networks, impedance matching networks, wave filters.

LUMPED PARAMETERS OR IMPEDANCES

When the impedance of a transmission line or device at the operating frequency may be considered as equivalent to devices concentrated at one point, and the parameters of the system including the line or device is not substantially independent of the load devices connected thereto, the transmission line or device may be said to have lumped parameters. Lumped impedances is also used to include devices such as capacitors, inductors, and resistors which have their impedance concentrated at the terminals thereof.

NETWORK

A network is made up of two or more resistances, inductances, capacities or mutual inductances connected together in some manner.

PASSIVE NETWORK

A network containing no source of energy and in which no energy is dissipated other than that accounted for the resistance of the components of the network.

PHASE DISTORTION

Results from different frequencies travelling with different velocities such that their relative arrival times differ from their relative starting times.

PHASE DISTORTION CHARACTERISTIC

Used to designate the change in displacement of different frequency components of a band of frequencies transmitted by a transmission device or network. For example, certain frequencies of the band will be retarded or advanced a different amount than other frequencies.

PHASE SHIFT

Used to designate the change in phase relation between voltage and current of the same wave energy, or between the voltages or the currents of different wave energy of the same frequency.

RESONATOR

Devices comprising conductive enclosures, cavities, or wave transmission line sections of the two terminal type, and having distributed inductance and capacitance, the line sections being terminated in other than the characteristic impedance of the line sections, the devices presenting resonant characteristics to the existing source of wave energy.

TAPERED LONG LINE

A long line having a physical dimension which changes progressively in the direction of wave propagation along the line.

TRANSMISSION LINE

As used in the subclass definitions is synonymous with wave transmission devices.

UNBALANCED CIRCUIT

A circuit having its conductors electrically unsymmetrical with reference to a potential plane. For example, a concentric line is ordinarily unbalanced, the outer conductor being ordinarily connected to ground.

WAVE ENERGY

An undulatory disturbance propagated through a medium, (usually periodic in nature), its displacement varying periodically with respect to time or distance or both. The wave may be manifested in electrical, mechanical or acoustical form. However, in this class the term “wave energy” refers only to electrical wave energy.

WAVE FILTER

Coupling networks which include significant structure permitting free transmission of electric waves of a single frequency or band of frequencies (which may include zero frequency) while attenuating substantially electric waves having other frequencies, or attenuating substantially electric waves of a single frequency or

band of frequencies (which may include zero frequency) while permitting free transmission of electric waves having other frequencies.

WAVE GUIDE

A transmission device designed to propagate electrical waves having an electric or magnetic field component extending in the direction of propagation. The wave guide may be a hollow dielectric or metal tube, or a solid dielectric rod, the wave energy being propagated along the interior of the tube or rod and confined by the walls of the tube or rod.

WAVE PROPAGATION CHARACTERISTIC

Effect of the impedance characteristic of the transmission device upon the wave energy propagated by the transmission device, (e.g., the effect of transmission device or network to change the amplitude, phase of or delay in transmission as a function of frequency). Changes in the impedance parameters of the transmission device or in impedances associated therewith change the wave propagation characteristics of the transmission device.

WAVE SHAPING

Passive networks for modifying an electrical wave passing therethrough so that the amplitude-time characteristic of the output wave is different from that of the input wave and which have no function classified in other classes.

WAVE TRANSMISSION DEVICE

Any device which is used to guide or constrain electrical wave energy and to convey the energy from one place to another. Included are conductors, wave guides, resonant structures (e.g., cavities, etc.)

WAVE TRANSMISSION SYSTEM

One of more wave transmission devices with or without appropriate coupling networks or transmission line characteristic modifying means arranged to convey electrical energy from one or more places to one or more other physically separated places. The system may be arranged so that different electrical energies may be conveyed in different directions at the same or different times over the system.

WAVE TRAP

A resonant circuit designed to exclude the energy of one particular frequency. It is analogous to a filter which is used to block one frequency and to pass other frequencies. It usually has circuit components equivalent to a filter, but may be used only to exclude energy of a particular frequency from a circuit.

SUBCLASSES

1 This subclass is indented under the class definition. Systems comprising (a) two or more wave transmission lines or networks, each line or network being operable to separately propagate wave energy or (b) means for effecting an interchange of wave energy from one transmission line to two or more transmission lines or vice versa, or having a coupling network for effecting an interchange of wave energy from a single input to plural outputs or vice versa, together with means for controlling or facilitating the interchange of energy.

(1) Note. The term “network” as used above denotes any of the systems defined in the Class Definition, subsection A.

(2) Note. Included in (a) above are systems having two distinct transmission lines, each line being operable to transmit wave energy electrically distinct from that propagated by another of the transmission lines, and also lines which are distinct but not necessarily simultaneously usable to transmit electrical wave energy (e.g. one line may be used to substitute for another as in subclass 3). The two or more transmission lines may have a common conductor, see especially subclasses 4+ where a balanced circuit is involved.

(3) Note. Included are lines which transmit energy from a first point to a second spaced point and provided with means to transmit a portion of the energy to a second line (e.g. a tapped line).

(4) Note. This and the indented subclasses do not provide for systems where a signal is divided among two transmission lines or networks and then recombined on a single line or to provide a single output. Such systems and networks are

found in subclasses 12 et seq. If the system claimed does not extend to the recombining part of the line or network, the patent is classified in this or the indented subclasses.

(5) Note. A system having a single transmission line and pilot line to sense only ambient conditions (temperature, humidity) is not classified as a plural channel system. See subclass 15 for this subject matter. A system with a single communication transmission line and also a pilot line which is a long line within the class definition and which transmits wave energy is classified in this or indented subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:

15, see (5) Note above.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, appropriate subclasses for electrical conductor structure adapted for use in plural channel systems other than loaded lines or transmission lines defined as having long line characteristics.

178, Telegraphy, appropriate subclasses for plural channel systems involving telegraphy, note subclass 45 for plural channel systems using a loaded line.

307, Electrical Transmission or Interconnection Systems, particularly subclasses 11+, 43+, 113+, and 147+ for miscellaneous electrical distribution systems involving plural channels.

330, Amplifiers, subclass 295 for plural channel transistor amplifiers, subclass 69 for sum and difference amplifiers, subclasses 73 and 74 for series arranged amplifiers with plural outputs and plural inputs, respectively, subclass 84 for plural channel amplifiers having feedback, subclasses 124+ for plural channel amplifiers generally, subclasses 147 and 148 for amplifiers having plural inputs and plural outputs, respectively. See especially, subclasses 54 and 286+ for “distributed amplifiers”.

334, Tuners, appropriate subclasses for tuners, per se.

439, Electrical Connectors, particularly subclasses 775+, 865+, 869+, 874+, 877+, 883, and 884+ for various types of electrical connections and terminals.

340, Communications: Electrical, appropriate subclasses for miscellaneous electrical communications, including signalling systems, involving plural channels. Note particularly subclasses 870.11+, and 870.41, and 870.27 for continuously variable indication communication systems involving plural transmitters, plural receivers, and plural circuits respectively.

343, Communications: Radio Wave, particularly subclass 771 for plural slot type antennas with wave guide coupling; subclasses 814 and 816 for plural balanced doublet type antennas with a coupling network; subclass 852 for antennas with a plural path coupling network with impedance matching; subclasses 853+ for plural antennas with a coupling network; and subclass 858 for antennas coupled to plural leadins.

370, Multiplex Communications, subclass 200 for a phantom circuit, and subclass 308 for a resonant transfer technique used in the multiplex system.

379, Telephonic Communications, appropriate subclasses for plural channel systems involving telephony, see subclasses 338+ for circuits having a two-way repeater (amplifiers) therein.

455, Telecommunications, appropriate subclasses for modulated carrier communication and radiotelephone communication systems, which may include wireless distribution and plural channel radio communication systems.

1.1 This subclass is indented under subclass 1. Systems which include gyromagnetic elements for effecting a nonreciprocal interchange of electrical energy among the transmission lines or through the coupling network.

(1) Note. The term "gyromagnetic" as applied to material designates magnetically polarized material (e.g., ferrites, garnets, ionized gases) having unpaired spin systems which exhibit significant precessional motion in an orthogonal R.F. field. The term "nonreciprocal" designates a particular interchange of electrical energy that does not satisfy the reciprocity theorem. For example, a nonreciprocal interchange exists when the electrical output at a first set of terminals of a network produced by an input at a second set of terminals of the network does not equal the output at the second set of terminals produced by the same input applied at the first set of terminals. The term "circulator" (to which most of the patents in this subclass pertain) designates a device with at least three terminals wherein power entering at terminal 1 exists at terminal 2 only, power entering at terminal 2 exists at terminal 3 only, and power entering at terminal 3 exists at terminal 1 only.

SEE OR SEARCH THIS CLASS, SUBCLASS:

24.1, 24.2 and 24.3, for single channel coupling networks including gyromagnetic material for effecting a nonreciprocal transfer of electrical energy.

SEE OR SEARCH CLASS:

330, Amplifiers, subclass 4, 4.8 and 63 for amplifiers using gyromagnetic elements.

455, Telecommunications, subclasses 318+, for mixers using gyromagnetic elements.

2 This subclass is indented under subclass 1. Plural channel systems having means to sense a condition in the system and to control the operation of the system in accordance with the condition so sensed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

17+, and the subclasses specified in the notes thereto for single channel automatically controlled systems and networks.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, particularly subclass 39, 86+, 116+, and 326+ for miscellaneous plural channel electrical transmission or interconnection systems which involve automatic control.

323, Electricity: Power Supply or Regulation Systems, subclasses 234 through 303 for condition sensing regulators.

3 This subclass is indented under subclass 2. Systems comprising at least one normally operative wave transmission line and a spare transmission line, and automatically operable means associated with the transmission lines for using the spare transmission line in place of the normally operative transmission line upon failure of the normally operative line.

(1) Note. Systems for automatically substituting a particular device or system for a normally operative device or system are in general classified with the particular device or system. For example, systems for substituting repeaters in a two way repeater system are classified in Class 379, Telephonic Communications, subclasses 338+ and systems for substituting for defective amplifier system or a part of an amplifier system (such as a vacuum tube) are classified with the amplifier systems in Class 330, Amplifiers, subclasses 84 and 124+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

13, for resonator type breakdown discharge systems which control the transmission over a line.

100+, for branched circuits with nonautomatic transmission line switching.

262+, for transmission line elements, which may include switching devices.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, particularly subclass 23, 39, 64+, and 80+ for miscellaneous electrical systems of distribu-

tion which involve automatic substitution of electrical load circuits or supply circuits.

331, Oscillators, subclass 49 for plural oscillator systems wherein one oscillator may be substituted for another.

4 This subclass is indented under subclass 1. Systems wherein at least one of the transmission lines is a balanced line, or having a network under subclass 1 which is especially designed for connection to at least one balanced circuit.

(1) Note. A balanced line or circuit is a line or circuit having its conductors electrically symmetrical with respect to a reference potential plane (e.g. ground).

SEE OR SEARCH THIS CLASS, SUBCLASS:

12, for transmission line inductive or radiation interference reduction systems, involving a balanced transmission circuit.

25+, for coupling networks for coupling a single channel balanced circuit to an unbalanced circuit.

236+, for single transmission lines of the long line type, which may be balanced.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, particularly subclasses 32+, 37+, 40+, and 68.1+ for electrical conductor structure of the electrically balanced type other than loaded lines or transmission lines defined as having long line characteristics.

307, Electrical Transmission or Interconnection Systems, particularly subclasses 12+, 42 or 147+ for miscellaneous electrical transmission or interconnecting systems which include balanced circuits.

343, Communications: Radio Wave, subclass 814 and 816 for plural balanced doublet antennas with coupling networks; and subclass 865 for a balanced antenna with a balanced coupling network.

363, Electric Power Conversion Systems, particularly subclasses 2+, 9+, 36, and 148+ for balanced phase conversion systems for converting electrical energy from one number of phases to a different number of phases (e.g., single phase to polyphase).

365, Static Information Storage and Retrieval, subclass 202 for complementing or balancing signals used in a read/write circuit.

370, Multiplex Communications, subclass 200 for a phantom circuit used in the multiplex system, and subclasses 278 and 282+ for a duplex system which may include a balance circuit.

379, Telephonic Communications, for telephone systems which involve balanced transmission lines.

5 This subclass is indented under subclass 4. Systems having a plurality of balanced transmission lines or having a network which is designed for connection to a plurality of balanced circuits.

SEE OR SEARCH THIS CLASS, SUBCLASS:

25+, for coupling networks for coupling a single channel balanced circuit to an unbalanced circuit.

12 This subclass is indented under the class definition. Subject matter including a transmission line producing inductive or radiation interference or subject to such interference from an external source and means such as one or more filters, screens or compensating circuits, disposed along an appreciable length of the line for substantially reducing this interference.

(1) Note. Subclass 12 does not include mere echo or anti-singing systems. Such systems in a single channel system where classified in this class are classified with the first occurring (lowest numbered) subclass providing for any of the components used in the system. For echo-suppressing and/or anti-singing systems in plural channel systems, see subclasses 406+ of Class 379, Telephonic Communications.

SEE OR SEARCH THIS CLASS, SUBCLASS:

5, for plural channel systems, which are balanced to prevent undesired radiation effects.

24+, for networks which may be used to reduce undesired currents in a transmission line, and particularly subclasses 138+ for balanced circuits coupled to unbalanced circuits and subclasses 165+ for wave filters and for transmission lines connected to filters which block such undesired currents.

236+, for long line transmission line structure which inherently reduce interference radiation effects and which involve no shielding structure or means in addition to the conductor arrangement or structure (e.g. co-axial lines), see especially subclasses 243+.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, subclasses 32+ and the subclasses specified in the notes thereto for structure and conductor arrangements for preventing or reducing the detrimental effects due to either self-inductance of a single conductor or mutual inductance between plural conductors, other than loaded lines or transmission lines defined as having long line characteristics.

178, Telegraphy, subclass 45 for loaded lines with inductive or radiation reduction means, subclass 63, for cable or long line telegraph systems having means for eliminating "tailings" or having static compensation; and subclass 69 for telegraph line clearing and circuit maintenance systems having means for preventing the detrimental effects produced by induction from external or internal causes.

307, Electrical Transmission or Interconnection Systems, subclasses 89+ for miscellaneous electrical systems having anti-induction means or means to prevent undesired coupling to other systems.

331, Oscillators, subclass 67 for oscillator systems provided with an electromagnetic or electrostatic shield.

343, Communications: Radio Wave, subclasses 841+ for antennas with an electrical shield; subclass 851 for antennas with a coupling network having a radiation suppressor; and subclass 905 for antennas combined with shielded transmission lines.

361, Electricity: Electrical Systems and Devices, subclasses 1+ for transmission lines with means to protect the connected lines from the effects of lightning and other high potential, and for networks for use in surge suppression circuits, see especially subclass 50 for systems with means to adjust for varying leakage currents; subclasses 82 and 84+ for systems for protecting balanced electrical systems (e.g., polyphase) for balanced current flowing therein; subclasses 88+ for voltage responsive systems; subclass 111 for transient responsive systems; and subclasses 177+ for high voltage dissipation systems (e.g., lightning arresters).

365, Static Information Storage and Retrieval, subclass 198 for transmission lines used for reading and writing information.

379, Telephonic Communications, subclass 398, for telephone systems having means for preventing the detrimental effects occasioned by induction from external or internal causes.

13 This subclass is indented under the class definition. Systems which include a resonant device and a space discharge structure positioned at a point of high potential on said resonant device, the space discharge structure breaking down in response to energy above a predetermined level in a transmission line connected to the resonant device to modify the effective electrical characteristics of the resonant device so as to block substantially the flow of any energy over the transmission line, free passage of energy occurring over the line when the energy fails to attain this predetermined level.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, for plural channel systems which include a resonator type breakdown discharge system for substantially blocking a channel where the discharge device is made conductive by a high energy level in the transmission line, and subclasses 100+ where the discharge device is made conductive by energy other than the energy in the transmission line.

2+, 14, 15, 16, 17+, and 81, for other systems within the class definition which reduce the amplitude of the wave energy but which do not involve the use of a resonator type breakdown discharge device.

262, for transmission line elements and components which perform a switching or blocking function, other than resonator type breakdown discharge systems.

SEE OR SEARCH CLASS:

313, Electric Lamp and Discharge Devices, subclasses 567+ for miscellaneous gaseous discharge device structure, including lightning arresters, and subclasses 324 and 325 for lightning arresters of the spark or arc type which operate in the open air.

315, Electric Lamp and Discharge Devices: Systems, subclasses 32 through 371 for miscellaneous gaseous discharge systems and particularly subclass 39 for the structural combination of a discharge device and a resonant device, i.e., combined in an integral or nonseparable manner.

323, Electricity: Power Supply or Regulation Systems, subclasses 304 through 317 for self-regulating systems.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 365+ for miscellaneous gating circuits which utilize electron tubes.

361, Electricity: Electrical Systems and Devices, subclasses 1+ for miscellaneous systems for protecting electrical apparatus by opening a circuit or making a shunt or short circuit when the current exceeds a predetermined value, see especially subclass 112 where the system includes electronic tubes, and subclasses 117+ for lightning arrester systems which include an arc discharge device.

455, Telecommunications, subclasses 78+ for T-R or R-T radio systems.

14 This subclass is indented under the class definition. Networks including a non-linear device for decreasing the amplitude range of the signal applied to the device, and a nonlinear device connected to receive the wave having the decreased amplitude range for increasing or restoring the amplitude range of the signal, and long line transmission lines in combination with such networks.

(1) Note. This subclass provides for amplitude compression and expansion systems even though the system includes an active element such as a vacuum tube type amplifier. See (3) Note below.

(2) Note. This subclass does not include devices which merely shift the amplitude level up or down merely to control the peak amplitude without controlling the amplitude range. Neither does this subclass include the combination of a limiter or clipper and an amplifier which cuts off the higher amplitudes and then amplifies the remaining portion of the wave energy so that the output wave does not contain any variations in wave form above a certain amplitude level, and is not therefore a function of the input wave energy.

(3) Note. In the compressor portion of the compander, the input waves of smaller amplitudes may be increased in amplitude while the input waves of larger amplitude may be increased by a smaller ratio or decreased. All amplitudes of the wave may be decreased, the larger amplitudes being decreased to a smaller extent. The expander portion may operate in a similar manner except to increase the amplitude range.

SEE OR SEARCH THIS CLASS, SUBCLASS:

20, for miscellaneous passive type wave shaping networks which modify the amplitude time characteristic of the signal transmitted therethrough.

81, for the attenuator network in this class which reduces the energy of the signal passing therethrough.

SEE OR SEARCH CLASS:

178, Telegraphy, subclass 45, for loaded lines in combination with a compander.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 309+ for a miscellaneous limiter with an amplifying circuit.

330, Amplifiers, subclass 96, 123 and 129+ for amplitude range compressors or expanders of the amplifier type where the input signal is applied to a control grid of an amplifier tube whose bias is controlled in accordance with the signal intensity to produce the necessary compression or expansion, and wherein the output signal is abstracted from the plate of the amplifier tube. Subclasses 143 and 144+ for compressors or expanders where a variable impedance element is included in the signal path and the variable impedance is controlled in accordance with the signal intensity. The combination of an amplitude compressor and expander (i.e., a compander) one or both being of the amplifier type is classified in this class, (333) subclass 14. However, where such combinations involve correction only of an amplifier condition and not a condition of the transmission line, classification is with amplifiers Class 330. Combinations of an amplifier and a limiter where the output more substantially conforms to the input wave form are classified in Class 330. See Class 250, subclass 27, above.

369, Dynamic Information Storage or Retrieval, subclass 133 for phonograph recording and reproducing systems involving amplitude range compression and expansion.

370, Multiplex Communications, subclass 202 for a multiplex system which includes an amplitude compression or expansion means.

381, Electrical Audio Signal Processing Systems and Devices, subclass 106 for one-way audio signal transmission having amplitude compression/expansion.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclasses 500+ for systems changing the frequency range of a band of audio signal frequencies, transmitting the energy at the changed range, and restoring the transmitted audio signal to its original frequency range.

15 This subclass is indented under the class definition. Systems including an auxiliary line so structurally related to a transmission line that a change in the transmission line characteristics caused by a change in an ambient condition, such as temperature or humidity, will be accompanied by a change in a parameter of the auxiliary line, and means controlled by this change in parameter to compensate for the change in transmission line characteristics.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, for plural channel systems including a pilot line.

16, for systems utilizing a pilot current for purposes of control.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclass 294 for impedance systems in general which are automatically controlled in response to a thermal condition.

330, Amplifiers, subclass 52, for amplifier systems having control means, wherein the control is exercised by a pilot signal. See the Class Definition of Class 330 for the line between this class (333) and Class 330 where pilot signals are involved.

379, Telephonic Communications, subclasses 338+ for repeater systems (e.g. two way amplifier system) which utilize a pilot line to compensate for changes in the transmission characteristics of the main line.

16 This subclass is indented under the class definition. Systems including means for compensating for changes in the signal energy passing over a transmission line caused by changes in the line characteristics, wherein a control signal distinct from and in addition to the signal energy is also passed over the line to be influenced by the changes in line characteristics, the control signal being used to control the compensating means.

(1) Note. Systems for automatically compensating for changes in the characteristics of a transmission line where the carrier current of the transmitted energy is used to control the compensating means are classified in subclasses 17+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, for plural channel systems utilizing a pilot frequency.
15, for systems utilizing for a pilot line for control purposes.
17.1+, see (1) Note above.

SEE OR SEARCH CLASS:

330, Amplifiers, subclass 52 for amplifier systems having pilot signal control means. See Class 330, Class Definitions for the line between the two classes where such subject matter is involved.
379, Telephonic Communications, subclasses 338+ for repeater systems (e.g., two way amplifier system) which may utilize a pilot current to compensate for changes in the transmission characteristics of the main line.

17.1 AUTOMATICALLY CONTROLLED SYSTEMS:

This subclass is indented under the class definition. Subject matter having means to sense a condition in the system and to modify a wave propagation characteristic of the system in accordance with the condition so sensed.

(1) Note. The automatic control must be of the wave propagation characteristic of a transmission line, system or network which would be classified in this class. Where the system or network includes a component or device which, per se, is not classified in the class, combined with a transmission line, system or network which causes classification of the subject matter in this class, and the automatic control is only with respect to such component or device which is classified, per se, in another class. Then the patent is not classified in this or the indented subclass, but is classified in subclass providing for the subject matter claimed. For example, a wave filter combined with an automatically operated current or voltage magnitude control means does not effect the wave propagation characteristic of the filter are classified in subclasses 165+ below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, for plural channel systems including automatic control.
13, for resonator type breakdown discharge systems which are automatically controlled.
14, for amplitude compression and expansion systems including automatic control.
15, for pilot line controlled systems involving automatic operation.
16, for pilot current controlled systems including automatic operation.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, appropriate subclasses, especially subclasses 92+, 97, 99, and 116 for miscellaneous electrical distribution systems with automatic control means.
323, Electricity: Power Supply or Regulation Systems, subclasses 234 through 303 for condition sensing regulators.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 509+ and 518+ for miscellaneous externally effected or control circuits.

331, Oscillators, subclasses 1+ for oscillator systems utilizing a phase or frequency sensing means for automatically stabilizing the oscillator frequency subclass 183 for oscillator systems having means for automatically controlling or stabilizing the amplitude of the generated oscillations and subclass 186 for oscillator systems with a particular source of power or bias voltage of the automatically regulated type.

336, Inductor Devices, particularly subclasses 30+ for inductor devices automatically adjustable in response to a condition.

17.2 Limiting of Amplitude:

This subclass is indented under subclass 17.1. Subject matter including means to limit the amplitude to a predetermined level.

SEE OR SEARCH THIS CLASS, SUBCLASS:

81, for systems and networks that selectively lower the input signal level to a desired amount.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 264 and 540+ for limiting the amplitude of pulses in nonlinear solid state circuits.

17.3 Impedance Matching:

This subclass is indented under subclass 17.1. Subject matter in which the condition sensed is utilized to control circuitry that performs an impedance matching function in the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

32+, for impedance matching circuits of the nonautomatically controlled type.

SEE OR SEARCH CLASS:

455, Telecommunications, subclasses 120+ for frequency tuning a transmitter to an antenna.

18 This subclass is indented under subclass 17. Systems and networks provided with automatically operated means to control an equalizer and delay network.

(1) Note. This subclass includes systems including an equalizer and/or a delay network which is automatically controlled in response to some condition in the system and also equalizers and/or delay networks which are provided with other automatic control means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12, for automatic equalization and/or delay control networks utilized for preventing, suppressing or eliminating interference.

15, for automatic equalization and/or delay control networks controlled by the signal derived from a pilot line.

16, for automatic equalization and or delay control networks involving a pilot current control.

28, for nonautomatic equalizers.

138+, for nonautomatic delay networks.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclasses 212 through 219 for automatic phase control systems involving a single frequency.

363, Electric Power Conversion Systems, subclasses 2+, 9+ and 36 for plural conversion systems involving phase conversion; subclasses 148+ for phase conversion systems, per se; particularly subclass 149 for phase conversion systems involving automatic voltage magnitude or phase angle control.

19 This subclass is indented under the class definition. Passive networks for producing an output wave which is the time derivative or time integral of the input wave.

(1) Note. See the internal and external search notes under subclass 20 of this class for wave shaping systems which may involve differentiating and/or integrating networks.

SEE OR SEARCH THIS CLASS, SUBCLASS:

20, for passive networks for shaping the output wave to other than the time derivative or time integral of the input wave. Also see (1) Note above.

SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclasses 609+ and 611+, particularly subclasses 621+ for position servomechanisms which include stabilizing control features such as integrating and differentiating networks; subclasses 141+ for generator fed motor systems having generator control including anti-hunt or rate of change response; subclass 702 for synchronous motor systems having anti-hunt or anti-damping control; subclass 448, for open loop automatic motor control systems involving anti-hunt control; and subclasses 456+ for systems responsive to the rate of change of a condition.

322, Electricity: Single Generator Systems, subclass 19 for systems for automatically controlling the rate of change or hunting of a generator or its driving means.

323, Electricity: Power Supply or Regulation Systems, subclasses 212 through 219 for miscellaneous phase control networks which involve differentiating or integrating networks.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclass 335 for miscellaneous differentiating circuits and subclasses 336+ for miscellaneous integrating circuits.

708, Electrical Computers: Arithmetic Processing and Calculating, subclass 822 and 823+ for calculators performing computations involving differentiation and integration, respectively.

20 This subclass is indented under the class definition. Passive networks for modifying an electrical wave passing therethrough so that the amplitude time characteristic of the output wave is different from that of the input wave and which have no function classified in other classes, and long line wave transmission systems in combination with a passive wave shaping network.

(1) Note. The networks are usually designed to modify or shape a single pulse and usually involve a delay network or equivalent delay means.

(2) Note. Included are long transmission lines in combination with a wave shaping network which is designed to restore the wave shape to a wave which has been distorted by transmission over the transmission line.

(3) Note. Excluded are mere limiter networks which shape the wave merely by cutting off the wave above a predetermined amplitude.

(4) Note. Many systems and networks inherently function to wave shape. Most of these systems are excluded as they include active elements, such as oscillation generators, amplifiers, detectors, etc. Where the network is primarily designed for a purpose other than wave shaping, such as controlling the magnitude of current in the circuit, the network is excluded even though the control of the current magnitude is effected by a means which also effects the wave shape of the element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for systems combining wave energy from different channels and/or separating wave energy into different channels.

14, for amplitude range compression and expansion systems.

19, for wave shaping networks producing a time derivative or time integral of the applied wave energy (i.e. differentiating or integrating networks).

28, for networks modifying the attenuation or attenuation and phase characteristic with respect to frequency of the energy passing therethrough (i.e. equalizers).

81, for attenuator networks.

SEE OR SEARCH CLASS:

84, Music, subclasses 622+, 626+, 659+, 671 - 677 and 692 - 711 for systems for the electrical production of complex waves in musical instruments.

178, Telegraphy, subclasses 2+, and particularly subclasses 63, 69 and 69.1 for telegraph systems involving combining and/or separating and/or shaping of electric waves.

307, Electrical Transmission or Interconnection Systems, subclasses 106+ for waveform or wave shape determinative or pulse producing systems which are class appropriate. The networks and systems in Class 307 may involve long line elements, but ordinarily include also a specific source of wave energy or pulse producing means, such as a DC source and switching means.

324, Electricity: Measuring and Testing, subclasses 76.12+ for electrical systems for the analysis of complex waves, and subclasses 76.39+ for electrical frequency measuring systems which involve wave analysis.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 100+ for miscellaneous converting, shaping, or generating circuits such as miscellaneous limiters and clock or pulse production circuits.

330, Amplifiers, subclasses 53+ for amplifier systems combined with a long line element, where the amplifiers may correct for the distortions caused by the long line.

331, Oscillators, subclasses 75+ for oscillator systems combined with an output circuit including a space discharge or unilaterally conductive device, which device may provide a wave distorting or shaping function.

332, Modulators appropriate subclasses for modulator systems which involve wave shaping.

340, Communications: Electrical, subclasses 825.77+ for selective electrical communication systems wherein the selective means is responsive to the amplitude of the signal.

363, Electric Power Conversion Systems, appropriate subclasses for conversion systems which involve wave shaping, see subclasses 34+ for systems for converting A.C. to D.C. and then connecting the D.C. to A.C., subclasses 39+ for conversion systems with means to introduce or eliminate frequency components, and subclasses 157+ for frequency conversion systems. The systems in Class 363 usually involve the use of alternating current which is repetitive and do not involve the shaping of a single pulse.

379, Telephonic Communications, appropriate subclasses for telephone systems involving combining and/or separating and/or shaping of electric waves.

21 This subclass is indented under the class definition. Wave transmission systems comprising means for changing guided waves having one field configuration to a different field configuration, the original and changed waves each having a longitudinal electric or magnetic field component.

(1) Note. This subclass includes means for changing a rectangular TE wave pattern to a circular TE wave pattern, e.g. for changing a plane polarized guided wave to a circularly polarized guided wave, or from one type of polarized wave to another.

SEE OR SEARCH THIS CLASS, SUBCLASS:

248+, for mode filters or suppressors, and for wave guide junctions (e.g. rotary joints involving mode conversion and reconversion).

SEE OR SEARCH CLASS:

343, Communications: Radio Wave, subclass 756 for antennas with a polarization converter; and subclasses 909+ for radio wave polarizers, per se.

22 This subclass is indented under the class definition. Networks specialized for use with and designed for connection to the end of a long line transmission line and including a resistive component for dissipating the wave energy

propagated along the line and presenting an essentially resistive impedance to the line, and the combination of long transmission lines with energy dissipating terminations.

(1) Note. Usually the impedance presented by the network is equal to the characteristic impedance of the line for which it is designed.

(2) Note. The termination classified here is usually more than a mere resistance element such as is classified in Class 338, Electrical Resistors. The termination includes some structure, such as a long line element or component, so that the device is not of general utility, but is limited to use with a transmission line. Long lines with mere resistance elements which would, per se, be classified in Class 338, are included in this subclass (22) when the resistance element is designed for use as a long line dissipating termination.

SEE OR SEARCH THIS CLASS, SUBCLASS:

23, for networks simulating transmission lines (i.e. artificial lines) whose function is not essentially dissipating terminal energy.

32+, for impedance matching networks whose function is coupling as opposed to termination.

81, for attenuators, which dissipate only a portion of the wave energy applied thereto.

SEE OR SEARCH CLASS:

343, Communications: Radio Wave, subclass 18 for radio wave absorption devices; subclasses 731+ for traveling wave type antennas which may involve a dissipating termination; and subclasses 739+ for antennas with a terminating resistance at open end.

361, Electricity: Electrical Systems and Devices, subclasses 117+ for surge dissipators and lightning arresters.

23 This subclass is indented under the class definition. Networks for simulating impedance characteristics of a smooth or loaded electrically long transmission line over a frequency range.

SEE OR SEARCH THIS CLASS, SUBCLASS:

22, for dissipating terminations for long lines which usually have an impedance characteristic equal to the characteristic impedance of the line.

28, for equalizing networks having impedance characteristics usually the inverse of electrically long transmission lines.

81, for attenuators.

SEE OR SEARCH CLASS:

330, Amplifiers, subclass 57, for amplifiers utilizing artificial lines. (This also includes the “distributed amplifiers”).

24 This subclass is indented under the class definition. (1) Networks including significant reactive structure for effecting the transfer of oscillator energy from one circuit to another circuit and having attenuation and/or delay characteristics over a frequency range for attenuating and/or delaying in a predetermined manner, wave energy passing therethrough, and/or providing an impedance match between the network and at least one of the circuits; (2) smoothing type wave filters having shunt capacitance, or series inductance, or both usually designed to pass direct current and to reduce the effect of any undesired alternating or pulsating current, or to pass direct current and low frequency alternating current or pulsating current and to reduce the effect of any undesired higher frequency alternating or pulsating current, and (3) systems within the class definition including one or more of the networks defined in (1) or (2) above.

(1) Note. The coupling networks under the above definition usually include a shunt impedance common to the input and output circuits.

(2) Note. The systems included are single channel systems having coupling networks, and include for example echo suppression on a single channel where the echo would be due to an impedance mismatch, or the elimination of echo in a single channel system by using a delay line. Such systems are classified in the first indented subclass which provides

for the network used in the system. See section I, subsection C, of the Class Definition.

(3) Note. Class 323, Electricity: Power Supply or Regulation Systems, is the miscellaneous class for systems for coupling a single source to a single load circuit using only transformers and/or impedances. Also, see (4) Note below.

(4) Note. Coupling networks using an electronic tube as a part of the network are not included in this or the indented subclass, but are classified in the appropriate class providing for the system. For examples, see the Search Class notes below.

(5) Note. See the Search Class notes below for a reference to the classification lines between coupling networks and antennas combined with such coupling networks.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for plural channel systems involving coupling networks.

17+, for automatically controlled systems involving coupling networks.

81, for attenuators of the resistive type.

245+, for transmission line joints within the class definition which do not modify the characteristics of the wave propagated therethrough or do not effect an impedance match between dissimilar impedance lines or networks.

SEE OR SEARCH CLASS:

178, Telegraphy, appropriate subclasses for coupling networks in combination with code signaling systems or apparatus other than telephony. See subclass 64 for such systems for transmitting messages by induced currents utilizing an induction coil or transformer, and for such systems having an induction coil or transformer between sections of the main line.

307, Electrical Transmission or Interconnection Systems, particularly subclasses 1+ for miscellaneous superimposed current systems involving coupling networks, and subclasses 11+ and 43+ for miscellaneous plural load or plural supply systems which include coupling networks.

323, Electricity: Power Supply or Regulation Systems. See (3) Note, above. Class 323 provides for the miscellaneous transformer and impedance systems and includes structural combinations of different impedances which are electrically connected together.

323, Electricity: Power Supply or Regulation Systems, for a coupling network using tubes to control the current and/or voltage magnitude and/or for phase control where there is a single input and output and at least a part of the input energy appears in the output circuit. (See the (4) Note above)

327, Miscellaneous Active Electrical Nonlinear Devices, subclasses 261+ for a delay system using tubes; subclasses 552+ for a filter using tubes; subclass 231 for a phase shifter using tubes where the input energy is applied to an input electrode (e.g., grid) of the tube to control a local source of energy (e.g., anode supply) connected to the output electrode of the tube (See the (4) Note above)

330, Amplifiers, appropriate subclasses for various types of coupling networks involved in amplifier systems, subclass 116 for an amplifier system with means to couple a balanced line to an unbalanced line. (See the (4) Note above)

331, Oscillators, subclasses 74+ for oscillation generators combined with a particular output coupling network.

334, Tuners, for tuners, per se. See also (4) Note above for tuners combined with other systems.

336, Inductor Devices, appropriate subclasses for the structure of transformers and inductances of the passive type.

343, Communications: Radio Wave, subclass 743 for high frequency loop type antennas with feed coupling at spaced points on the loop; subclass 771 for slot type antennas with wave guide coupling; subclasses 814, 816 and

820+ for balanced doublet type antennas with a coupling network, subclasses 850+ for antennas in general with a coupling network or impedance in the leadin; subclass 700, (11) Note, for the classification lines between coupling networks and antennas combined with such coupling networks (see the (5) Note above).

361, Electricity: Electrical Systems and Devices, subclasses 600+ for miscellaneous combinations of different impedances which are not in circuit relationship (e.g., a variable condenser combined with a resistance with no electrical connection between them).

379, Telephonic Communications, appropriate subclasses for telephone systems having coupling networks. If the system is limited to use with speech (other than by mere name), such as including a microphone or reproducer (e.g., loudspeaker) the system is classified in Class 381, see subclasses 338+ for repeaters utilizing hybrid coil systems.

455, Telecommunications, subclasses 91+ for radio transmitters involving coupling networks and subclasses 130+ (particularly subclasses 338+) for radio receivers involving coupling networks.

24.1 This subclass is indented under subclass 24. Networks which include gyromagnetic elements for effecting a nonreciprocal transfer of oscillatory energy from one circuit to another circuit.

(1) Note. See (1) Note under subclass 1.1 above for a definition of the terms “gyromagnetic” and “nonreciprocal”. Many of the patents in this generic subclass 24.1 are directional phase shifters, and relate to networks that shift the phase of energy passing through by different amounts depending on the direction of passage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1.1, for plural channel nonreciprocal gyromagnetic systems. See also (1) Note above.

138+, for delay networks generally.

202+, for waveguide filters generally.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing, subclasses 300+ for nuclear or electronic induction measuring or testing devices.

330, Amplifiers, subclass 4, 4.8 and 63 for amplifiers using gyromagnetic elements.

455, Telecommunications, subclass 323 for mixers using gyromagnetic elements.

24.2 This subclass is indented under subclass 24.1. Networks wherein the attenuation in one direction of propagation through the network is substantially greater than in the opposite direction.

(1) Note. The attenuation in one direction may be substantially zero.

SEE OR SEARCH THIS CLASS, SUBCLASS:

81, for attenuators generally.

24.3 This subclass is indented under subclass 24.1. Networks wherein the polarization of the electric vector of the wave energy propagated through the network is rotated in the same absolute sense for both directions of propagation.

(1) Note. Included in this subclass are the so-called anti-reciprocal or Faraday rotators.

SEE OR SEARCH THIS CLASS, SUBCLASS:

248+, for rotators generally.

25 This subclass is indented under subclass 24. Networks including four terminals, the impedance across one pair of terminals being symmetrical and the impedance across another pair of these terminals being unsymmetrical with respect to a given potential plane (e.g., ground), these impedances being effective to convert symmetrical potential applied at the symmetrical pair of terminals to unsymmetrical potential at the other pair of terminals or to convert unsymmetrical potential applied at the unsymmetrical pair of terminals to symmetrical

potential at the other pair of terminals, and systems under the class definition including a balanced to unbalanced circuit coupling.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for plural channel systems, which involve coupling a balanced circuit to an unbalanced circuit or vice versa.

12, for systems for reducing inductive or radiation interference and which include coupling between balanced and unbalanced circuits.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclasses 212 through 219 for phase control systems with means to introduce delay into a part of the system, and including such systems using reactive impedances and transformer systems to obtain a phase shift (e.g., a 1805 shift) and which are designed for use at a single frequency.

329, Demodulators, appropriate subclasses for demodulators having inputs or outputs which are balanced or unbalanced.

330, Amplifiers, subclass 275 and 301 for transistor amplifiers with balanced-to-unbalanced coupling and vice versa, subclass 116 for amplifier systems having balanced-to-balanced coupling, and subclass 117 for amplifier systems having unbalanced-to-balanced coupling.

343, Communications: Radio Wave, subclass 821 for balanced doublet type antennas with a balanced to unbalanced coupling network; and subclass 859 for antennas in general with a balanced to unbalanced coupling network.

363, Electric Power Conversion Systems, subclasses 2+, 9+, 36, and 148+ for systems converting energy from one number of phases to a different number of phases.

26 This subclass is indented under subclass 25. Balanced to unbalanced circuit coupling networks and systems where the coupling network includes a long line element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

236+, for long lines.

245+, for long line elements.

27 This subclass is indented under subclass 24. Coupling systems having a long line with a coupling network at each opposed ends of the long line.

(1) Note. Where the long line is merely a part of a coupling network, and does not link two different coupling networks together, classification is not in this subclass. See subclasses 156+ for this type of delay network, subclasses 50+ for this type of impedance matching network, 202+ for this type of wave filter.

(2) Note. In this subclass are systems having two coupling networks with a long transmission line connected to transmit energy from one network to the other. These systems approach a complete system. For example, a 70 ohm source connected by a network to a 300 ohm line which is coupled by a network to a 150 ohm receiver. At each point of connection there would be a coupling network.

SEE OR SEARCH THIS CLASS, SUBCLASS:

50+, see (1) Note above.

156+, see (1) Note above.

202+, see (1) Note above.

236+, for long lines, per se.

SEE OR SEARCH CLASS:

178, Telegraphy, appropriate subclasses where the system is limited to code signaling other than telephony.

330, Amplifiers, subclasses 53+ for amplifier systems combined with long lines or long line elements wherein such means furnish a coupling means for the amplifier.

379, Telephonic Communications, subclasses 90+ for composite telephone systems (e.g., combined power and telephone circuit) and subclasses 338+ for two telephone lines with two-way repeaters at spaced points along the line.

381, Electrical Audio Signal Processing Systems and Devices, subclasses 82+ for public address and similar systems (e.g., a microphone and a line, or a line and a reproducer such as a loudspeaker or a microphone, a line and a reproducer).

28 This subclass is indented under subclass 24. Networks with attenuation or attenuation and phase distortion characteristics which vary over a frequency range for use in a wave transmission system for modifying the attenuation or attenuation and phase characteristics of the wave energy as a function of frequency, and systems within the class definition which include such networks.

(1) Note. Equalizer networks are used to reduce the attenuation or attenuation and phase distortion characteristics which the wave energy in a long line transmission system would have in the absence of the network. The network may be used for predistorting so that the distorting effect of the long line will be corrected.

(2) Note. A filter is distinguished from an equalizer in that a filter is intended and designed to transmit a frequency or one or more bands of frequencies without modification while undesired frequencies are attenuated to a low value so that the desired frequency or frequencies are transmitted by the filter and the undesired frequencies are substantially blocked, while the equalizer has the function of changing the relative amplitudes of the waves of different frequency over the range of frequencies transmitted by the equalizer.

(3) Note. Included are tone control networks which involve only passive elements and which vary the attenuation or attenuation and phase distortion characteristics over a range of frequencies. Included are such networks as are used for “bass boosters”, “treble boosters”, “treble cut systems”, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

18, for this subject matter where the equalizer is provided with automatic control means.

20, for wave shaping systems.

81, for attenuator networks within the class definition composed entirely of resistive elements.

138+, for phase control or delay networks, per se.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for miscellaneous impedance and transformer systems, and for phase control systems.

330, Amplifiers, appropriate subclasses, particularly subclass 109, 120, 122, 154, 157+, 185+, 192+, and 304, for amplifier systems combined with an equalizer network.

332, Modulators, subclass 107 for distortion control in pulse modulators, subclasses 123+ for distortion control in frequency modulators, subclasses 144+ for distortion control in phase modulators, and subclasses 159+ for distortion control in amplitude modulators.

381, Electrical Audio Signal Processing Systems and Devices, subclasses 98+ for audio signal processing devices and systems having frequency control.

455, Telecommunications, subclass 267 for radio receivers with tone control networks.

32 This subclass is indented under subclass 24. Coupling networks which include one or more impedance elements constructed or proportioned to substantially eliminate the reflected wave energy between the network and at least one of the connected circuits caused by impedance differences; impedance matching networks, per se; and systems within the class definition which include such networks.

(1) Note. The particular construction or proportioning producing the impedance

match should be claimed for classification in this subclass.

(2) Note. The impedance need only to be matched to pass the energy or frequency band of energy desired.

SEE OR SEARCH THIS CLASS, SUBCLASS:

8+, for branched plural channel systems having impedance matching.

17+, for systems wherein the impedance match is automatically controlled.

22, for line terminations involving impedance matching.

81, for attenuators having means for compensating for changes in terminal impedance caused by adjustment of the attenuator so as to match the impedances of the attenuator to the connected input and/or output circuit.

236+, for long lines wherein reflected wave energy arising from the line structure is compensated.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing subclasses 600+, especially subclasses 612+ for the miscellaneous measurement and testing of impedance mismatch between circuits, and subclass 140+, for systems and apparatus for the measurement of voltage, current or power ratios which are indicative of impedance mismatch.

343, Communications: Radio Wave, subclass 822 for balanced doublet type antennas with an impedance matching coupling network; and subclasses 860+ for antennas in general with an impedance matching coupling network.

33 This subclass is indented under subclass 32. Impedance matching networks and systems including a long line element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

236+, for long lines.

245+, for long line elements.

SEE OR SEARCH CLASS:

343, Communications: Radio Wave, subclass 862 for antennas with an impedance matching coupling network including a long line element.

34 This subclass is indented under subclass 33. Impedance matching networks and systems wherein the long line element lies along the path of wave propagation through the network and has a physical dimension progressively increasing or decreasing along the path of propagation to result in a corresponding change in electrical parameters of the long line element.

SEE OR SEARCH CLASS:

343, Communications: Radio Wave, subclass 863 for antennas with an impedance matching coupling network including a tapered long line element.

35 This subclass is indented under subclass 33. Impedance matching networks and systems wherein the component having distributed electrical parameters lies along the path of wave propagation through the network and is an odd integral number of quarter-wave lengths long.

SEE OR SEARCH CLASS:

343, Communications: Radio Wave, subclass 864 for antennas with an impedance matching coupling network including a long line element of the quarter-wave transformer type.

81 This subclass is indented under the class definition. Devices and networks consisting of one or more elements which exhibit only a positive resistance effect and which reduce the intensity of the energy passing through the device by dissipation, (1) the elements being proportioned to permit a change in their value to control the energy loss while maintaining substantially constant input and/or output impedance of the device, and/or (2) the elements being proportioned to permit the device to be inserted in the circuit to provide an energy loss without introducing any reflections in the circuit, and/or (3) the elements being combined with a long line or long line element, and/or (4) the device or network having an

impedance equal to the impedance of a specified long line and/or (5) the device or network is claimed as being particularly modified for use over a frequency band so that its characteristics are particularly related to frequency, and (6) systems within the class definition including such devices or networks.

(1) Note. The networks and devices of part 5 of the definitions may include means such as capacitors to compensate for deviations in attenuation caused by changes in frequency of the applied energy, so that the device or network acts as a pure resistance. The network or device may be modified to obtain uniform attenuation over a band of frequencies.

(2) Note. Included are T, H, pad, and ladder or lattice type networks as well as transmission line sections.

(3) Note. This subclass embraces devices wherein one or more of the elements include reactance to compensate for any inherent reactance of the element or elements, see (1) Note.

(4) Note. If the device or network does not maintain a constant input and/or output impedance, or if it would introduce reflections into the transmission line, it is excluded from this class and will be found in Class 323 Electricity: Power Supply or Regulation Systems.

SEE OR SEARCH THIS CLASS, SUBCLASS:

13, for resonator type breakdown discharge systems, which include attenuation networks.

14, for amplitude compression and expansion systems which include attenuation networks.

15, and 16, for pilot controlled systems which include attenuation networks.

17+, for automatically controlled systems which may include attenuation networks.

22, for transmission line terminations which dissipate the applied energy.

24+, for adjustable reactive type coupling networks in general, see especially subclass 28 for equalizer networks.

SEE OR SEARCH CLASS:

181, Acoustics, appropriate subclasses, for devices for attenuating sound, see subclass 206 for mufflers.

323, Electricity: Power Supply or Regulation Systems, see (4) Note above.

330, Amplifiers, appropriate subclasses under 157+, 185+ and 192+ for amplifiers having significant coupling which may include attenuators.

338, Electrical Resistors, appropriate subclasses, for electrical resistors, per se; and subclasses 68+ for mechanically variable resistors including potentiometers and rheostats.

99 This subclass is indented under the class definition. Subject matter which is not provided for in any of the preceding subclasses in this class.

100 **Having branched circuits:**

This subclass is indented under subclass 1. Systems including means for effecting an interchange of wave energy from one transmission line to two or more transmission lines, or vice versa, or having a coupling network for effecting an interchange of wave energy from a single input to plural outputs, or vice versa, of energy together with means for controlling or facilitating this interchange of energy.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, for plural channel branched circuit systems having automatic controlled means to control the system.

4+, for plural channel systems and coupling networks wherein at least one of the transmission lines is a balanced line or where the network is especially designed for coupling to at least one balanced line.

13, for resonator type breakdown discharge circuits which include a space discharge device designed to breakdown in response to high level energy (e.g., from the transmitting section of the system) to block substantially the flow of high level energy, and to pass low level energy along the transmis-

sion line (e.g., to a receiver). The devices in subclass 13 include T-R and R-T systems.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, particularly subclass 38, 43, 49, and 71+ for branched electrical conductor structures other than loaded lines and conductors defined as having long line characteristics.

307, Electrical Transmission or Interconnection Systems, particularly subclasses 11+, 43+, and 147+ for miscellaneous electrical distribution systems which include branched circuits.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 407+ for miscellaneous circuits for use in coupling plural channels to a single channel.

331, Oscillators, subclasses 60+ for an electrical oscillation generator provided with plural output circuits.

343, Communications: Radio Wave Antennas, subclass 771 for plural slot-type antennas with wave guide coupling; subclasses 776+ for plural waveguide type antennas with coupling; subclasses 814 and 816 for plural balanced doublet type antennas with a coupling network; subclasses 853+ for plural antennas generally with a coupling network; subclass 858 for antennas coupled to plural leadins.

375, Pulse or Digital Communications, subclasses 268+, 353 for duplex systems having an antenna coupling network coupling a transmitter and a receiver to an antenna.

439, Electrical Connectors, subclasses 150+ and 242 for multiple connector structure; subclasses 241+ for line tapper connector structure such as alligator clips and test probes.

455, Telecommunications, subclasses 132+ for antenna coupling networks for plural receivers where the coupling network includes an active element and/or significant receiver structure; and subclasses 103+ for similar subject matter for transmitters.

101 Including switching means:

This subclass is indented under subclass 100. Systems with means for abruptly connecting and disconnecting two or more transmission lines to or from another transmission line.

(1) Note. The systems in this subclass usually having means to reduce reflected waves resulting from impedance discontinuities or irregularities caused by the presence or operation of the connecting and disconnecting means.

(2) Note. Plural circuit switches restricted to use in a particular art are sometimes classified with the art, for example, switches in telegraph systems and switches in telephone systems are classified elsewhere.

(3) Note. Variable power dividers which are classified below normally have a continuously variable transfer of power which is not abrupt.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, for similar systems having automatically controlled means.

3, for automatically controlled line substitution systems.

13, for single channel resonator type break-down discharge systems where the resonator-discharge device is used to effectively short circuit or open circuit the line (e.g., R-T or T-R systems).

258, and 262, for transmission line elements for single channels which may be used to perform a switching or blocking function.

SEE OR SEARCH CLASS:

178, Telegraphy, for switches in telegraph systems

200, Electricity: Circuit Makers and Breakers, particularly subclasses 1+ and 19.01+ for plural circuit switches of general utility and not limited by claimed structure to use with long lines.

307, Electrical Transmission or Interconnection Systems, particularly subclass 23, 38+, 64+, 80+, 85+, 98+, and 112+ for miscellaneous electrical distribution systems which include switching.

331, Oscillators, subclass 49 for plural oscillator systems provided with means for selectively connecting one or more of two or more oscillators to a common output circuit.

379, Telephonic Communications, for switches in telephone systems, especially subclasses 242+.

102 Having gyromagnetic operating means:
This subclass is indented under subclass 101. Subject matter whereby a gyromagnetic element, e.g., fettile, is used as the switching element.

103 Having semiconductor operating means:
This subclass is indented under subclass 101. Subject matter whereby the switching means is a semiconductive element (e.g., diode).

104 Using TEM lines:
This subclass is indented under subclass 103. Subject matter whereby the dominant mode in the transmission lines is of the type having only transverse electromagnetic components.

(1) Note. Examples of such lines are coaxial lines, striplines, and microstrip lines.

105 Having mechanical switching means:
This subclass is indented under subclass 101. Systems wherein the means for abruptly connecting and disconnecting two or more transmission lines to or from another transmission line is a mechanical element.

(1) Note. The systems in this subclass usually have means to reduce reflected waves resulting from impedance discontinuities or irregularities caused by the presence or operation of the connecting and disconnecting means.

(2) Note. Plural circuit switches restricted to use in a particular art are sometimes classified with the art, for example, switches in telegraph systems are classified in Class 178, Telegraphy, and switches in telephone systems are classified in Class 379, Telephonic Communications, see especially subclasses 242+.

(3) Note. Variable power dividers normally have a continuously variable transfer of power which is not abrupt.

(4) Note. Examples of the types of mechanical elements used are movable shorting pins, rotating assemblies, and movable transmission lines.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, for similar systems having automatically controlled means.

3, for automatically controlled line substitution systems.

13, for single channel resonator type breakdown discharge systems, where the resonator discharge device is used to effectively short circuit or open circuit the line (e.g., R-T or T-R systems).

262, for connection and disconnection of long lines.

SEE OR SEARCH CLASS:

200, Electricity: Circuit Makers and Breakers, particularly subclasses 1+ and 19.01+ for plural circuit switches of general utility and not limited by claimed structure to use with long lines.

307, Electrical Transmission or Interconnection Systems, particularly subclass 23, 38+, 64+, 80+, 85+, 98+, and 112+ for miscellaneous electrical distribution systems which include switching.

331, Oscillators, subclass 49 for plural oscillator systems provided with means for selectively connecting one or more of two or more oscillators to a common output circuit.

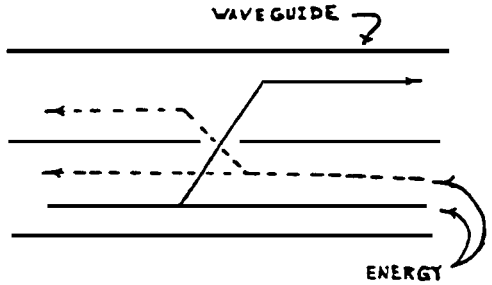
106 Using rotary switching means:
This subclass is indented under subclass 105. Subject matter wherein the mechanical element rotates about an axis through the switch device.

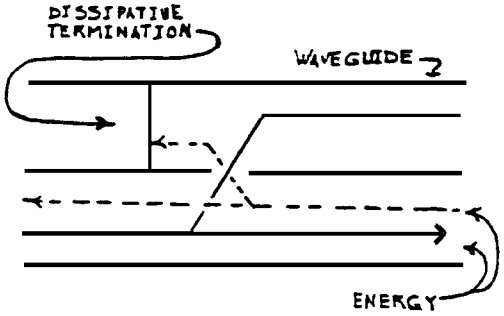
107 For TEM lines:
This subclass is indented under subclass 106. Subject matter whereby the dominant mode in the transmission lines is of the type having only transverse electromagnetic components.

108 For waveguide:
This subclass is indented under subclass 105. Subject matter whereby the transmission device propagates electrical waves having and electric or magnetic field component extending in the direction of propagation.

109 Using directional coupler:
This subclass is indented under subclass 100. Wave transmission systems including two transmission lines having an intervening coupling which propagates a portion of the energy passing in one direction along the first line in the second line in only one direction from the coupling, and which propagates a portion of the energy which may pass in the other direction along the first line in the second line in the opposite direction only from the coupling.

(1) Note. The second line may include a means, such as a dissipative termination, so that the energy from one direction only will be propagated to a distance in the second line. For example,





SEE OR SEARCH THIS CLASS, SUBCLASS:
117, for a plurality of lines connected to a line by means of a hybrid coil.

110 For providing frequency separation:
This subclass is indented under subclass 109. Subject matter wherein the interchange of energy results in the separation or combination of a plurality of frequencies or frequency bands.

111 For providing adjustable coupling:
This subclass is indented under subclass 109. Subject matter wherein the amount of electromagnetic energy transferred between the first and second transmission lines can be changed to provided a different coupling ratio.

112 Having lumped parameters or impedances:
This subclass is indented under subclass 109. Subject matter wherein an impedance element is included which may be considered as concentrated at one point.

(1) Note. See the class definition for the definition of “lumped parameters” or impedances.

113 Having parallel-guide waveguide:
This subclass is indented under subclass 109. Subject matter wherein the first and second transmission lines are waveguides; the direction of energy propagation in the first and second lines being parallel in the coupling region.

114 Having crossed-guide waveguide:
This subclass is indented under subclass 109. Subject matter wherein the first and second transmission lines are waveguides; the direc-

tion of propagation in the first and second lines being transverse to each other in the coupling region.

115 Having TEM lines:
This subclass is indented under subclass 109. Subject matter wherein the first and second transmission lines are the type having only transverse electromagnetic components and no longitudinal electromagnetic components as their primary mode of operation.

116 Using stripline:
This subclass is indented under subclass 115. Subject matter wherein each of the first and second transmission lines have a planar center conductor and a planar ground plate.

117 Including hybrid-type network:
This subclass is indented under subclass 100. Systems including coupling one wave transmission line to two or more wave transmission lines in such manner that there is a conjugate relation between at least two of these coupled transmission lines to prevent any interchange of energy between the conjugately related lines.

SEE OR SEARCH THIS CLASS, SUBCLASS:

22, for transmission line terminations for hybrid-type networks.

23, for artificial lines adapted for use in hybrid systems.

24+, for single channel coupling networks. 109, for branched circuits including a directional coupler so that wave energy passing in one direction along a first line will be propagated in the second line in only one direction from the coupling, and wave energy passing in the other direction along the first line will be propagated only in the opposite direction from the coupling.

169, and 170+, for bridge-type filter networks.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclass 365 for bridge-type impedance systems.

336, Inductor Devices, appropriate subclasses for the structure of transformers per se.

370, Multiplex Communications, appropriate subclasses, particularly subclasses 276+ for a duplex system, subclass 308 for a resonant transfer system, and subclasses 498+ for combining or distributing information via time channels which may include a hybrid circuit.

379, Telephonic Communications, subclasses 338+ for repeater systems including hybrid-type networks; and subclasses 402+ for telephone substation circuits including hybrid-type networks.

455, Telecommunications, subclasses 7+ for radio repeaters including hybrid networks.

118 Having lumped parameters or impedances:
This subclass is indented under subclass 117. Subject matter having impedance elements which may be considered as concentrated at one point.

119 Using transformer coil:
This subclass is indented under subclass 118. Subject matter wherein the impedance element consists of mutually coupled windings.

120 Having hybrid ring junction:
This subclass is indented under subclass 117. Subject matter wherein the hybrid transmission line forms a closed loop, there being a plurality of ports connected to the loop.

121 Having hybrid-T (e.g., magic-T):
This subclass is indented under subclass 117. Subject matter wherein the hybrid has four ports; energy being interchanged between the first port and two other ports, with no energy propagation from the fourth port, and the first and fourth ports being decoupled.

122 Using waveguide:
This subclass is indented under subclass 121. Subject matter wherein the transmission line is of the type having an electric or magnetic field extending in the direction of propagation.

123 Having coaxial element:
This subclass is indented under subclass 117. Subject matter wherein the transmission is of the TEM type having an elongated center conductor and a surrounding outer conductor.

124 With impedance matching:
This subclass is indented under subclass 100. Systems wherein the interconnected or branched transmission lines present impedances at their junction to substantially eliminate the reflected wave energy caused by the junction or wherein one or more impedance elements are provided which are constructed or proportioned to substantially eliminate the reflected wave energy caused by the branched circuit coupling means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
2+, for branched circuit impedance matching which is automatically controlled.
22, for single channel transmission line terminations involving impedance matching.
32+, for single channel impedance matching coupling networks.

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclasses 600+ especially subclasses 612+ for the miscellaneous measurement and testing of impedance mismatch between circuits; and subclasses 140+ for systems and apparatus for the measurement of voltage, current, or power ratios which are indicative of impedance mismatch.
343, Communications: Radio Wave Antennas, subclass 852 for antennas with a plural path coupling network with impedance matching.

125 Including long line element:
This subclass is indented under subclass 124. Subject matter wherein a circuit element having distributed parameters is used.

126 For providing frequency separation:
This subclass is indented under subclass 125. Subject matter wherein the impedance matched branching network provides a different frequency or band of frequencies in each of the two or more transmission lines or in the plural outputs.

127 Using TEM lines:
This subclass is indented under subclass 125. Subject matter wherein the transmission lines are the type having only transverse electromagnetic components as their primary mode of operation.

128 Stripline:
This subclass is indented under subclass 127. Subject matter wherein the TEM lines are of the type having a planar center conductor and a planar ground plate.

129 For providing frequency separation:
This subclass is indented under subclass 124. Subject matter wherein the branched transmission lines provide a different frequency or band of frequencies in each of the two or more transmission lines.

130 Using resistors only:
This subclass is indented under subclass 124. Subject matter wherein the impedance matching elements consist solely of resistors.

131 Using coupled windings:
This subclass is indented under subclass 124. Subject matter wherein the impedance matching elements comprise inductively coupled coils (i.e., transformers and auto transformers).

132 For providing frequency separation:
This subclass is indented under subclass 100. Subject matter wherein the interchange of wave energy provides a different frequency or band of frequencies in each of the two or more transmission lines or in the plural outputs.

133 Utilizing electromechanical transducer:
This subclass is indented under subclass 132. Subject matter wherein an electrical wave driven mechanical vibrator determines the frequency characteristic of the branched circuit.

134 Utilizing long line element:
This subclass is indented under subclass 132. Subject matter wherein the transmission lines or coupling networks include an element having distributed parameters.

(1) Note. LONG LINE ELEMENT: A circuit element having distributed parameters, such as a resonator, or a waveguide. A long line element may be a part of a long line wave transmission device or used in a network with other circuit elements of the lumped parameter type, for example, as in the case of delay networks, impedance matching networks, and wave filters.

135 Including waveguide element:
This subclass is indented under subclass 134. Subject matter wherein the long line element is of the type having a magnetic or electrical component extending in the direction of propagation.

(1) Note. WAVEGUIDE: A transmission device designed to propagate electrical waves having an electric or magnetic field component extending in the direction of propagation. The waveguide may be a hollow dielectric or metal tube or a solid dielectric rod, the wave energy being propagated along the interior of the tube or rod and confined by the walls of the tube or rod.

136 Including long line element:
This subclass is indented under subclass 100. Subject matter wherein the branched circuit includes a circuit element having distributed parameters.

137 Using waveguide:
This subclass is indented under subclass 136. Subject matter wherein the long line element is of the waveguide type.

138 Delay lines including a lumped parameter:
This subclass is indented under subclass 24. Subject matter for retarding wave energy a predetermined time over a range of frequencies and systems within the class definition which include such networks and wherein one of the network parameters may be considered as concentrated at one point.

(1) Note. See the class definition for the definition of “lumped parameters”.

(2) Note. The time period may be constant over the range of frequencies or proportional to the frequency (e.g., the time of delay may be greater for the higher frequency).

(3) Note. This subclass does not contain pulse delay systems utilizing active elements.

(4) Note. Devices for adjusting or maintaining the phase angle between the current and the voltage of an electric wave of a single frequency, or the phase angle between the current or voltage of a single frequency with respect to a standard or with respect to the current or voltage of another circuit are classified in Class 323, Electricity: Power Supply or Regulation Systems, subclasses 212-219 wherein there is a single input source and a single output load and wherein the phase shift is produced by the device acting on the original electrical energy and not due to any interposed signal controlled transducer. Class 307, Electrical Transmission or Interconnection Systems, appropriate subclasses also provides for the miscellaneous phase control systems similar to these in Class 323 but having plural source circuits and/or plural load circuits.

(5) Note. Class 363, Electric Power Conversion Systems, subclasses 2, 9, 148, and indented subclasses provides for systems for transforming electrical energy having one number of phases to electrical energy having another number of phases.

SEE OR SEARCH THIS CLASS, SUBCLASS:
18, for automatically controlled delay networks.
19, for differentiating or integrating systems involving delay networks.

20, for wave synthesis and shaping systems involving delay networks.

28, for combined attenuation and phase control networks, per se.

SEE OR SEARCH CLASS:

178, Telegraphy, particularly subclass 17.5 for transmitter for storing or delaying messages or code signals; subclasses 45+ for wave transmission lines with inductive loading means to effect changes in the delay characteristics of the transmission lines; subclass 63 for phase or delay control means applied to high capacity transmission line systems; and subclass 69 for line-clearing and circuit maintenance systems which include distortion and phase correction means.

307, Electrical Transmission or Interconnection Systems, see (4) Note above.

323, Electricity: Power Supply or Regulation Systems, subclasses 212 through 219 , see (4) Note above.

324, Electricity: Measuring and Testing, subclasses 76.77+ for phase indicators.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 261+ for miscellaneous circuits which may include an electron discharge device or transistor and provide specific delay in producing an output waveform. see (3) Note above.

330, Amplifiers, appropriate subclasses for amplifiers combined with phase shifting networks and for phase inverter systems involving active elements having an amplifier function appropriate subclasses for phase compensation in amplifier systems. Also see (3) Note above.

329, Demodulators, subclasses 315+ for frequency demodulators and subclasses 345+ for phase demodulators.

331, Oscillators, appropriate subclasses for oscillation generators utilizing time delay networks, particularly subclass 82 for beam tube oscillators of the traveling wave type; and subclasses 135+ for phase shift oscillators, indented subclass 137 providing for such oscillators with a phase shift network of the RC ladder type.

332, Modulators, subclasses 144+ for phase modulation systems.

336, Inductor Devices, appropriate subclasses for the structure of inductive reactors.

343, Communications: Radio Wave Antennas, subclass 744 for high frequency loop-type antennas with series reactance in the loop; subclasses 749+ for antennas with lumped reactance for loading the antenna; and subclass 778 for plural waveguide-type antennas with phasing.

361, Electricity: Electrical Systems and Devices, subclasses 271+ for capacitor structure.

379, Telephonic Communications, subclass 398 and 415 for phase modifying means applied to anti-inductive systems.

139 Variable parameter:

This subclass is indented under subclass 138. Subject matter including at least one variable parameter for delay adjustment.

140 Physical structure:

This subclass is indented under subclass 138. Delay lines subject matter wherein the geometry of individual parameters or the physical distribution of elements is critical to obtaining the desired delay.

(1) Note. Included here would be inductive parameters having a specific core structure and/or winding geometry.

141 Delay lines including elastic bulk wave propagation means:

This subclass is indented under subclass 24. Subject matter for retarding wave energy a predetermined time over a range of frequencies and systems within the class definition which include such networks wherein structure is provided for converting electrical wave energy to bulk wave mechanical energy, and for transmitting the bulk wave mechanical energy for reconversion to electrical wave energy.

(1) Note. The time period may be constant over the range of frequencies or proportional to the frequency (e.g., the time of delay may be greater for the higher frequency).

(2) Note. The delay is due to the lower propagation velocity of waves in the mechanical wave transmission path.

(3) Note. Included as mechanical wave transmission devices in this subclass are such devices as fluid columns, bars, rods, and plates.

(4) Note. By elastic bulk wave propagation is meant energy transmitted through the interior of an elastic wave propagation medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:

186+, for electromechanical filters employing bulk mode resonators.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, appropriate subclasses, especially subclass 1 for mechanical systems of linkages to shift the phase of a wave.

310, Electrical Generator or Motor Structure, subclass 313 for piezoelectric surface acoustic wave devices; subclasses 334+ for various acoustic wave devices which use piezoelectric effects; and subclass 26 for miscellaneous magnetostrictive devices, per se.

318, Electricity: Motive Power Systems, subclass 116 for piezoelectric motors; and subclass 118 for magnetostrictive motors.

322, Electricity: Single Generator Systems, subclass 3 for magnetostrictive generator systems.

343, Communications: Radio Wave Antennas, subclasses 5+ for radar and other reflected wave radio systems used to measure distance and which use delay networks, see especially subclasses 9, 10+, and 12+.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 141 for underwater vibration transducers.

381, Electrical Audio Signal Processing Systems and Devices, subclasses 150+ for telephone transmitters and receivers using magnetostrictive or piezoelectric effects.

142 Multipath propagation:

This subclass is indented under subclass 141. Subject matter wherein the initial direction of mechanical wave energy is changed.

(1) Note. This subclass includes devices wherein changes in propagation direction result from reflection, diffraction, refraction, or mode conversion.

143 Spurious signal reduction:

This subclass is indented under subclass 142. Subject matter including means to reduce undesired signal generation.

(1) Note. Spurious signals may be generated by reflection, diffraction, refraction, or multiple mode generation.

144 Variable delay:

This subclass is indented under subclass 141. Subject matter wherein the effective length of the structure for transmitting mechanical waves may be varied to provide a variable delay.

(1) Note. Included in this subclass are devices wherein the propagation velocity within the structure for transmitting is a function of externally applied magnetic or electric fields, control voltages, radiation, or mechanical forces.

145 Nonuniform propagation path:

This subclass is indented under subclass 141. Subject matter in which the structure for transmitting mechanical waves is tapered, stepped, or includes a hollow, composite, anisotropic, or nonhomogeneous propagation path.

146 Helical propagation path:

This subclass is indented under subclass 141. Subject matter wherein the structure for transmitting mechanical waves includes a helical propagation path.

147 Propagation path has significant chemical or physical properties:
This subclass is indented under subclass 141. Subject matter wherein the material of the structure for transmitting mechanical waves significantly affects the delay characteristic.

(1) Note. The material, as a result if it is crystalline structure or of its composition, may provide low losses, low scattering, low dispersion, controlled dispersion, increased power handling capabilities, or temperature stability.

(2) Note. Included in this subclass are devices wherein the structure for transmitting mechanical waves is polarized, semiconductive, gyromagnetic, ferroelectric, superconductive, magnetoelastic, or is capable of magnetostatic wave propagation.

148 Including magnetostrictive transducers:
This subclass is indented under subclass 141. Subject matter wherein the conversion of electrical to mechanical energy or the conversion of mechanical to electrical energy is dependent on the magnetostrictive effect.

(1) Note. Magnetostrictive effect may be defined as the change in dimensions of a body when subjected to a magnetic field.

149 Significant transducer structure:
This subclass is indented under subclass 141. Subject matter not classifiable in other subclasses indented thereunder where the transducers used for electromechanical conversion are structured or dimensioned to provide high efficiency conversion, impedance matching, mode conversion, shock resistance, or nonreflective properties.

150 Delay lines including elastic surface wave propagation means:
This subclass is indented under subclass 24. Subject matter wherein structure is provided for converting electric waves to surface acoustic waves, transmitting the surface acoustic waves to a means for reconverting the acoustic waves to electrical waves.

(1) Note. This subclass is limited to devices where significant acoustic wave transmission is along the free surface of the transmission media.

(2) Note. The delay is due to the lower velocity of the waves along the free surface of the transmission means. No significant wave transmission is realized through the interior of the transmission.

(3) Note. The transmission media may comprise either flat or curved surfaces of a piezoelectric medium or a nonpiezoelectric medium having a surface coating of piezoelectric material.

SEE OR SEARCH THIS CLASS, SUBCLASS:
193+, for filters employing surface acoustic waves.

151 Spurious signal or mode cancellation means:
This subclass is indented under subclass 150. Subject matter including structure to reduce the effects of spurious mechanical or electric wave signals or modes on the output signal of the delay line.

(1) Note. Spurious modes or signals may result from reflections of elastic surface waves, undesired conversion of surface wave modes to bulk wave modes, nonlinearity of the means for transmitting surface waves, or from undesired capacitive coupling.

(2) Note. The mode cancellation means may include acoustic absorbers, shielding electrodes, obstacles in the surface acoustic wave path, or surface wave propagation substrates having anisotropic propagation properties.

152 Variable delay:
This subclass is indented under subclass 150. Subject matter including means for varying the delay.

(1) Note. Delay variation may be achieved by mechanical translation of the input and output transducers used for electromechanical conversion or by including

surface wave propagation substrates whose delay properties are altered by incident radiation, electron bombardment, or by the application of external field, forces, or control voltages.

(2) Note. The substrate material may include materials or coatings which are both semiconductive and piezoelectric, are both photosensitive and piezoelectric, or undergo significant dimensional changes or deformation as a function of externally applied heat or mechanical stress.

153 Including discontinuities within propagation means:

This subclass is indented under subclass 150. Subject matter wherein abrupt modifications are included in the elastic surface wave path so as to alter the delay or transmission characteristics of the path.

(1) Note. Such discontinuities may serve as reflectors, deflectors, diffractors, phase modifiers, or mode converters.

(2) Note. Transducers distributed along the wave transmission path to provide signal tapping functions (rather than wave perturbation) are not included here.

154 Significant transmitting or receiving transducer structure:

This subclass is indented under subclass 150. Subject matter wherein the transducers required for electromechanical wave conversion have structural attributes, relative orientation, spacing, or other structural organization critical with respect to contributing to desired wave delay or wave transmission characteristics.

(1) Note. Delay lines of the elastic surface wave type which include transducer structures providing spurious signal or mode cancellation functions are not classified here but are classified in subclass 151.

155 Temperature stabilization compensation:

This subclass is indented under subclass 150. Subject matter wherein the materials or structural elements included in the delay lines reduce the delay time variations caused by ambient temperature change.

156 Delay lines including long line elements:

This subclass is indented under subclass 24. Subject matter having distributed parameters and including significant structure for retarding wave energy a predetermined period of time over a range of frequencies and systems within the class definition which include such networks.

(1) Note. The time period may be constant over the range of frequencies or proportional to the frequency (e.g., the time of delay may be greater for the higher frequency).

SEE OR SEARCH THIS CLASS, SUBCLASS:

138, for delay structures wherein the wave energy to be retarded propagates along line elements which include both distributed and lumped elements.
202+, for wave filters including long line elements.
236+, for long lines.
245+, for long line elements and components.

SEE OR SEARCH CLASS:

343, Communications: Radio Waves Antennas, subclass 778 for plural waveguide-type antennas with phasing.

157 Waveguide:

This subclass is indented under subclass 156. Subject matter wherein the structure for retarding energy propagates electrical waves having an electric or magnetic field component extending in the direction of propagation.

(1) Note. The waveguide may be a hollow dielectric or metal tube or a solid dielectric rod, the wave energy being propagated along the interior of the tube or rod and confined or bounded by the tube or rod.

158 Including ferrite means:

This subclass is indented under subclass 157. Subject matter including ferrite within the waveguide.

(1) Note. The ferrite is usually biased by a fixed or variable external magnetic field so as to determine the magnitude of wave retardation.

159 Having mechanically movable delay control means:
This subclass is indented under subclass 157. Subject matter wherein the magnitude of wave retardation is adjusted by a movable dielectric or conductive member within or proximate to the waveguide.

160 Coaxial line:
This subclass is indented under subclass 156. Subject matter wherein the structure for retarding wave energy is a transmission line in which one conductor surrounds the other, the two having a common longitudinal axis.

161 Planar line structure (e.g., stripline):
This subclass is indented under subclass 156. Subject matter wherein the structure for retarding wave energy is a transmission line including two or more spaced planar conductors.

(1) Note. The planar line structure for classification here may be of the stripline type, the microstrip type, or the slot line type.

162 Helical line structures and lines developed from a helical structure:
This subclass is indented under subclass 156. Subject matter wherein the structure for retarding wave energy is a transmission line including at least one conductor having a helical configuration or a configuration developed from a helix.

163 Having plural concentric helices:
This subclass is indented under subclass 162. Subject matter wherein the structure for retarding wave energy is a transmission line including two or more concentric helical conductors.

164 Control of delay with semiconductive means:
This subclass is indented under subclass 156. Subject matter wherein the conductivity state of a semiconductive means associated with the delay line controls the magnitude of wave retardation.

(1) Note. The semiconductive means may include switching diodes, varactor diodes, or bulk effect semiconductors.

165 Frequency or time domain filters and delay lines utilizing charge transfer devices:
This subclass is indented under subclass 24. Subject matter for filtering or delaying wave energy wherein components of signals to be filtered or delayed are sensed, charge samples corresponding to the magnitude and/or phase of the signals are developed, the charges are sequentially transferred at a predetermined rate, and the charges are eventually sampled or sensed to develop filtered and/or delayed output signals.

166 Time domain filter:
This subclass is indented under subclass 24. Subject matter for filtering wave energy utilizing a tapped delay line wherein a required impulse response is synthesized by weighting and/or summing signals derived at the tap points.

167 Frequency domain filters utilizing only lumped parameters:
This subclass is indented under subclass 24. Subject matter having only parameters which may be considered as concentrated at one point and permitting free transmission of electric waves of a single frequency or band of frequencies (which may include zero frequency) while attenuating substantially electric waves having other frequencies, or attenuating substantially electric waves of a single frequency or band of frequencies (which may include zero frequency) while permitting free transmission of electric waves having other frequencies, and systems within the class definition which include such networks.

(1) Note. Tuners, which are closely analogous to the wave filters in this class, are classified in Class 334, Tuners. The tuners usually found in Class 334 consist of a lumped inductance and capacitance element together with structure means to vary either or both elements in order to change the mean resonant frequency of the tuner. The tuners in Class 334 may include one or more long line elements in addition to a lumped inductance or

capacitance element, or the tuner may consist of a distributed parameter type tuning unit which is adjusted in discrete, distinct steps. Two or more distributed parameter type tuner units which are of the continuously variable type and which are ganged together mechanically and/or electrically so as to have their mean resonant frequency adjusted in unison are properly classified in Class 334. Where only the bandwidth of the filter is varied without varying the mean resonant frequency, classification is in this class (333).

(2) Note. Filters combined with circuits having other functions classified in other classes are excluded and will be bound in other classes. See the classes referred to under "Search Class" below. Note the exception in the case of a mere current and or voltage control network combined with a filter in (4) Note.

(3) Note. Filters which include an active element are excluded. See Class 327, particularly subclasses 552+ where the active element is an electron tube or a transistor. Note that Class 327 includes some transversal filters.

(4) Note. Filters in combination with means merely to control the magnitude of the current and/or voltage in the network are included in this and the indented subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for plural channel systems which include filters and for filters with plural input and/or output terminals.

19, for differentiating or integrating networks which are analogous to wave filters.

20, for wave shaping networks which are analogous to wave filters and which may include wave filters.

28, for equalizing networks which are analogous to wave filters.

100+, where the filter includes branching means (e.g., a single input with plural outputs).

124+, for resonant filter networks for matching the impedance in branched circuits, and branched circuits with line sections analogous to wave filters for impedance matching purposes.

157+, for delay networks which are analogous to wave filters.

202+, for long lines having frequency discriminating properties.

219+, for resonators including those with tuning means.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 1 for mechanical wave filters for transmitting mechanical waves of a particular frequency or band of frequencies.

84, Music, subclasses 1.19+, 621, 622, 699+ or 736 for electrical systems used in musical instruments to produce musical tones which include wave filters or tuners.

178, Telegraphy, subclasses 2+ for telegraph systems involving wave filters; and particularly subclass 47 and indented subclasses for harmonic or reed type selective systems; subclass 49 for superposed current systems with frequency selection means.

181, Acoustics, subclasses 175+ for sound filters.

307, Electrical Transmission or Interconnection Systems, particularly subclass 105 for electrical distribution systems including wave filters and subclass 132 for circuit interrupting systems having filters to eliminate the higher frequency components.

322, Electricity: Single Generator Systems, subclass 58 for generator controls with means for suppressing or minimizing undesired frequencies.

323, Electricity: Power Supply or Regulation Systems. Note that Class 323 provides for "filters" which control only the voltage and/or current magnitude. If the circuit which performs the filtering action is arranged only to "buck out" or balance the undesired components, classification is in Class 323.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, particularly subclasses 552+ for unwanted signal suppression by an active filter which may utilize a transistor or an electron tube.

329, Demodulators, appropriate subclasses for a demodulator which includes tuning or filtering.

330, Amplifiers, subclasses 302+ for transistor amplifiers with frequency responsive means; subclass 86 for amplifiers having an automatically variable impedance in the feedback path; subclass 94 for amplifiers having a frequency responsive means in a cathode feedback path; subclass 109 for amplifiers with frequency responsive means in the feedback path; subclass 143 for amplifiers with a thermal impedance in the signal path which may be automatically variable; subclasses 144+ for amplifiers having an automatically variable impedance in the signal path including such subject matter involving a variable reactance for automatically tunable or selective circuits; subclass 154 for cascaded amplifiers including a resonant circuit; subclass 155 for amplifier circuits including means for unicontrol of the coupling circuits; and subclasses 157+ and 192+ for amplifier systems with significant interstage, input and output coupling which may include wave filters.

331, Oscillators, appropriate subclasses, particularly subclass 43, 76, 77, 110, and 138+ for oscillators utilizing a wave filter as an element thereof.

332, Modulators, appropriate subclasses for modulators involving wave filters.

340, Communications: Electrical, subclasses 825.71+ for selective communication systems which are frequency responsive.

343, Communications: Radio Wave Antennas, subclass 722 for antennas with a lumped reactance filter in the active antenna; and subclasses 745+ for antennas with a variable reactance for tuning the antenna.

363, Electric Power Conversion Systems, subclasses 39+ for conversion systems in combination with a filter.

370, Multiplex Communications, appropriate subclasses, particularly subclass 488 and 497 for a multiplex system which includes connecting filters.

379, Telephonic Communications, appropriate subclasses for telephone systems involving wave filters; and particularly subclass 2 and indented subclasses for composite systems utilizing wave filters; and subclasses 78, 79, 80, and 174 for anti-inductive systems and devices with wave discriminating properties.

381, Electrical Audio Signal Processing Systems and Devices, subclasses 98+ for audio signal processing devices and systems having frequency control.

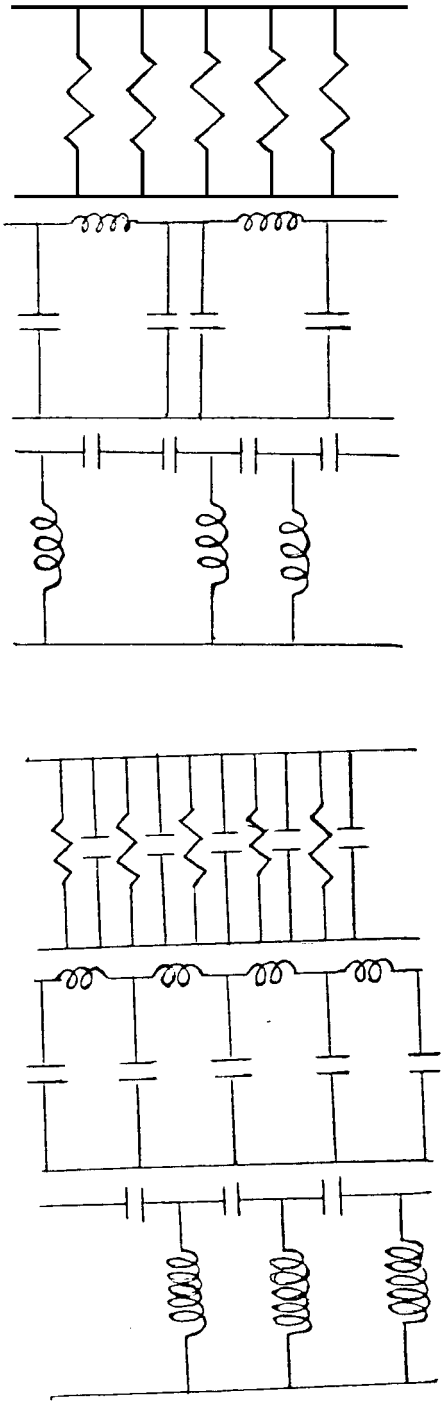
455, Telecommunications, subclasses 91+ for transmitters involving wave filters; and subclasses 150.1+ and 296+ (especially subclass 307) for radio receivers with filters or tuners.

168 Including recurrent sections:

This subclass is indented under subclass 167. Subject matter wherein similar or equivalent elements or groups of elements are cascaded.

(1) Note. Examples of filters classified here are ladder network or reiterations of “T” or “pi” networks whose formats are topos:graphically similar but whose

parameters may not be equal in every reiteration. Examples of such filters included are:

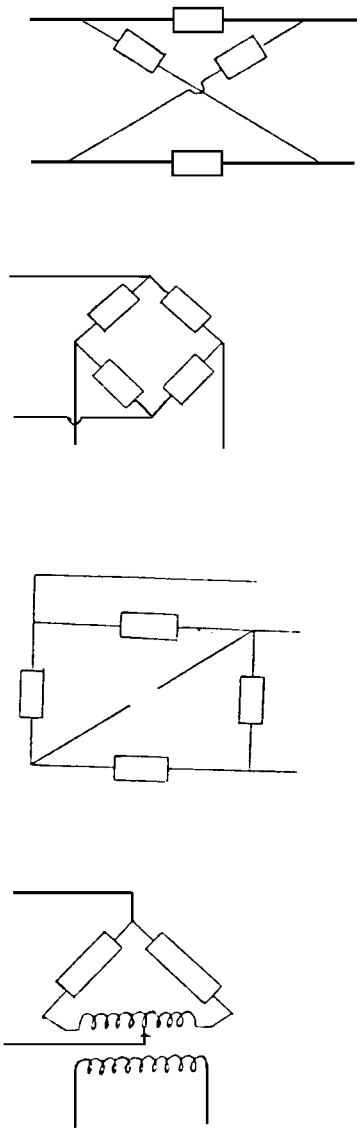


169 Wheatstone or lattice type:

This subclass is indented under subclass 167. Subject matter having four impedance branches connected in series to form a closed circuit, two nonadjacent junction points serving as input terminals while the remaining two junction points serve as output terminals.

(1) Note. Two of the impedance branches may be formed by a transformer winding having a mid-tap, the mid-tap forming one of the input or output terminals, and the other winding of the transformer forming the output or input connecting means. See Fig. 4 below.

(2) Note. Included are for example:



SEE OR SEARCH THIS CLASS, SUBCLASS:

117+, for hybrid-type networks used in branched circuits.

133+, for similar networks which include electromechanical transducer elements.

SEE OR SEARCH CLASS:

236, Automatic Temperature and Humidity Regulation, subclasses 69+, 74, 78, and 91 for temperature regulating systems which include impedance bridge networks as the control means.

318, Electricity: Motive Power Systems, subclass 294 for motor reversing systems wherein the armature current reversal means includes an impedance bridge network; and subclass 535 for motor field circuit control systems which include an impedance bridge network; and subclasses 663+ for position servomechanisms which may include a bridge in the error detector circuit.

322, Electricity: Single Generator Systems, subclass 77 for single generator systems where the generator field circuit is controlled by means of an impedance bridge network.

323, Electricity: Power Supply or Regulation Systems, subclass 365 for voltage magnitude control systems involving Wheatstone bridge arrangements.

324, Electricity: Measuring and Testing, appropriate subclasses, especially subclasses 98+ and 101+ for electric measuring and testing systems using impedance bridge arrangements.

330, Amplifiers, subclass 146 for amplifier systems having an amplifier in one arm of a bridge; and subclass 175 for amplifier systems having a lattice or Wheatstone bridge network in the signal coupling means.

331, Oscillators, subclass 110 and 138+ for bridge type oscillation generation systems in general.

332, Modulators, subclass 172 for amplitude modulating systems of the bridge type having conjugate input and output.

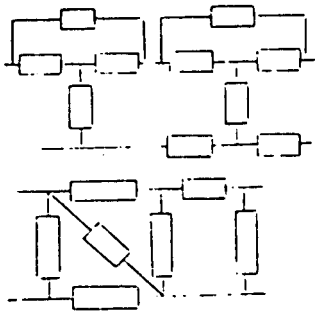
363, Electric Power Conversion Systems, subclasses 148+ for phase conversions arranged as a bridge.

170 Bridge type:

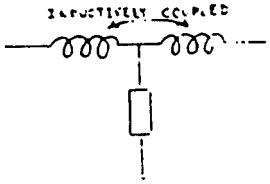
This subclass is indented under subclass 167. Subject matter having an impedance path containing a plurality of filter impedance units connected in series relation between an input and an output terminal, the filter also having a shunt connection containing an impedance connected to the junction of the series filter impedance units and to the other side of the line between the input and output terminals, an impedance path being connected to different ones of the series impedance units at points other than the junction between the units.

(1) Note. The last named impedance path is therefore in parallel with at least a portion of the series connected filter impedance units in the input circuit and the output circuit. The last named impedance path may include an inductive coupling.

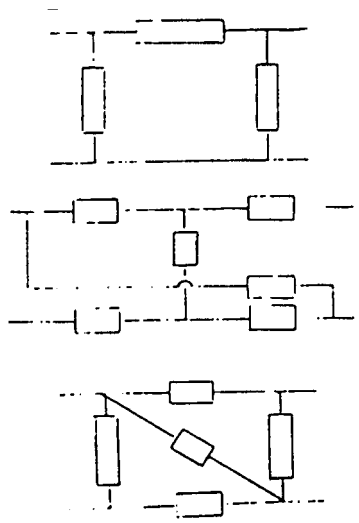
(2) Note. Examples of filter networks included and excluded are:



Included



Inductively Coupled



Excluded

SEE OR SEARCH CLASS:
331, Oscillators, subclass 142 in particular for bridge-type oscillators utilizing a double T bridge of the RC or RL element type.

171 With variable response:
This subclass is indented under subclass 170. Subject matter wherein at least one of the filter impedance units is made adjustable in order to vary the response of the filter.

172 RC or RL type:
This subclass is indented under subclass 167. Subject matter wherein the filter parameters are limited to combinations of resistance and capacitance or to combinations of resistance and inductance.

173 Synchronous filters:
This subclass is indented under subclass 167. Subject matter wherein the parameters of the filter are cyclically connected or disconnected.

(1) Note. The response (e.g., bandwidth, center frequency, harmonic rejection, etc.) is determined both by the magnitude of the filter parameters and by the rate at which the connections or disconnections are made.

174 With variable response:
This subclass is indented under subclass 167. Subject matter wherein at least one of the filter parameters is made adjustable in order to vary the response of the filter.

175 Resonant, discrete frequency selective type:
This subclass is indented under subclass 167. Subject matter which include resonant series and/or parallel inductance and capacity networks which offer a low impedance path to energy of a particular frequency or of a plurality of separate discrete frequencies and/or offer a high impedance path to energy of a particular frequency or of a plurality of discrete frequencies.

(1) Note. This subclass includes filters under its definition in which means are incorporated for sharpening the tuning of the resonant circuits as by compensating for the resistance in such circuits.

(2) Note. The filters in this subclass are especially designed to pass only a single discrete frequency or a plurality of discrete frequencies but not a continuous band, or to eliminate one or more discrete frequencies from a band of frequencies.

SEE OR SEARCH THIS CLASS, SUBCLASS:
197+, for similar filters utilizing electromechanical transducers.

SEE OR SEARCH CLASS:
330, Amplifiers, subclasses 302+ for transistor amplifiers with frequency responsive coupling; subclasses 94 and 109 for amplifiers with frequency responsive feedback means; subclass 154 for cascaded amplifiers having a resonant means in an interstage coupling circuit; subclasses 157+, 185+, and 192+, particularly subclasses 167, 189, and 196 for coupling circuits with resonant circuit means.
331, Oscillators, subclass 76 for oscillators, combined with an output coupling network including a harmonic selecting filter.

334, Tuners, appropriate subclasses for tuners adapted to be used in wave energy apparatus, also see the reference note to Class 334 in the search notes of subclass 167.

176 Including specific frequency rejection means:

This subclass is indented under subclass 175. Subject matter which include circuitry, provided for rejecting harmonics or for providing discrete transmission zeroes or attenuation poles within, at the edge of, or outside of, a prescribed filter pass band.

177 Transformer coupled:

This subclass is indented under subclass 167. Subject matter which include a mutual inductance link of the lumped type between the input and output of the filter.

(1) Note. The filters in this subclass are usually of the band-pass type, wherein the band-pass effect is due to the coupling between resonant circuits (e.g., intermediate frequency transformer systems with more than critical coupling between tuned primary and secondary circuits). The mutual inductance link need not be between the resonant circuits of the filter but may constitute the input or output coupling, the coupling between the resonant circuits being capacitive.

(2) Note. Wave filters wherein the mutual inductance link is of the long line type are not in this subclass but will be found in subclasses 125+ for branched circuit impedance matching networks; subclass 26 for balanced to unbalanced circuit conversion; subclasses 33+ for impedance matching networks; and subclasses 202+ for wave filters.

SEE OR SEARCH THIS CLASS, SUBCLASS:

197+, for electromechanical transducer-type filters involving transformer coupling.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclass 247, 301, 305, 328, and 355 for current and/or voltage magnitude control systems including transformers, and for miscellaneous transformer systems.

330, Amplifiers, subclass 154, 165+, 188+, and 195+ for amplifiers having transformer coupling.

336, Inductor Devices, appropriate subclasses for transformers which are not designed to be frequency responsive.

379, Telephonic Communications, subclasses 443+ for induction coils combined with the structure of telephone instruments.

178 Including bandwidth adjusting, shaping or stabilization means:

This subclass is indented under subclass 177. Subject matter wherein means are provided for adjusting the bandwidth or for maintaining constant bandwidth when circuit parameters are intentionally varied or when circuit parameters vary as a result of fluctuations in ambient conditions.

179 With permeability tuning means:

This subclass is indented under subclass 177. Subject matter wherein means are provided for varying the permeability of the mutual inductance link.

180 With variable coupling means:

This subclass is indented under subclass 177. Subject matter wherein means are provided to adjust the degree of coupling between circuit elements or groupings of circuit elements.

(1) Note. This subclass includes means to vary either inductive coupling, capacitive coupling, resistive coupling, or any combinations of such coupling.

181 Smoothing type (e.g., direct current power supply filters or decoupling filters):

This subclass is indented under subclass 167. Subject matter having shunt capacitance or series inductance, or both, usually designed to pass direct current and to reduce the effect of any undesired alternating or pulsating current superimposed on the direct current or to pass direct current and low frequency alternating current or pulsating current and to reduce the effect of an undesired higher frequency alternating or pulsating current.

(1) Note. Such filters usually have no resonant relationship between the inductance and capacitance over the range of applied frequencies.

(2) Note. These filters are usually of the "brute force" type, utilizing an excess inductance and/or capacitance. They are generally low pass, being adapted to pass direct current and to reduce the effect of any undesired alternating current superimposed on the direct current.

(3) Note. Included are systems with a smoothing-type filter combined with a passive network means to regulate the current or voltage applied to or abstracted from the filter.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems. If the circuit which performs the smoothing action does so only by "bucking out" or balancing the undesired components, classification is in Class 323.

330, Amplifiers, subclass 141 for amplifiers having smoothing circuits in the bias control path; subclass 142 for amplifiers including self-biasing circuits; and subclasses 199+ for amplifiers having significant power or bias supply means which may include significant details of smoothing filters.

363, Electric Power Conversion Systems, subclasses 39+ for conversion systems, (i.e., rectification or decertification) in combination with smoothing-type filters.

182 Feedthrough type:

This subclass is indented under subclass 181. Subject matter structured so as to include a central conductor concentrically surrounded by a capacitive or inductive element or by combinations of such elements.

(1) Note. These filter structures are usually adapted to be mounted in a partition, wall, or bulkhead, or to be mounted within a connector assembly.

183 Resiliently mounted components:

This subclass is indented under subclass 182. Subject matter wherein the central conductor or the inductive or capacitive elements are engaged to each other by resilient mounting structures.

(1) Note. The resilient mounting structures may include conductive or nonconductive elements providing for relative ease in assembling or disassembling of filter components and/or for providing relative ease in assembling filter components within a connector structure.

184 Monolithic structure:

This subclass is indented under subclass 181. Subject matter wherein inductive or capacitive elements are integrated on or within a common substrate or support.

185 Having significant physical structure:

This subclass is indented under subclass 167. Subject matter wherein the geometry of individual parameters or the physical distribution of such parameters is critical to obtaining the desired delay.

(1) Note. Included here would be inductive parameters having a specific core structure and/or winding geometry (i.e., low capacity windings).

186 Electromechanical filter:

This subclass is indented under subclass 24. Subject matter including at least one electrical wave driven mechanical vibrator as a frequency determining element, providing free transmission of electric waves of a single frequency or band of frequencies (which may include zero frequency) while attenuating substantially electric waves having other frequencies, or attenuating substantially electric waves of a single frequency or band of frequencies (which may include zero frequency) while permitting free transmission of electric waves having other frequencies, and systems within the class definition which include such networks.

(1) Note. In many of the devices in this and the indented subclass, the electrical wave energy is converted into mechanical energy which is transmitted to a means

for reconverting the mechanical energy to electrical wave energy. The mechanical energy transmitting means may be a bar, rod, fluid, etc. The mechanical transmission member determines the frequency of the energy transmitted.

SEE OR SEARCH THIS CLASS, SUBCLASS:

148+, for delay networks of the electromechanical transducer type which are analogous to wave filters.

SEE OR SEARCH CLASS:

178, Telegraphy, subclass 49 for telegraph systems utilizing vibrating elements for transmitting undulating currents.

181, Acoustics, subclasses 207+ for mufflers and sound filters, see subclass 207 for rods designed to transmit mechanical vibrations and to damp out other mechanical vibrations and designed to act as mechanical filters.

310, Electrical Generator or Motor Structure, subclasses 311+ for piezoelectric devices; and subclass 26 for the miscellaneous magnetostrictive devices.

318, Electricity: Motive Power Systems, subclass 118 for magnetostrictive motors; and subclass 116 for piezoelectric motors.

322, Electricity: Single Generator Systems, in the appropriate subclasses for electromechanical transducers of the motor generator type.

323, Electricity: Power Supply or Regulation Systems, subclasses 201 through 204 for dynamoelectric systems.

330, Amplifiers, subclass 174 for amplifier systems having an electromechanical transducer coupling element; magnetostrictive means in an amplifier system are classified in subclass 60.

331, Oscillators, appropriate subclasses particularly subclass 73, 116, 139, and 154+ for oscillators employing an electromechanical resonator or transducer as an element thereof.

336, Inductor Devices, subclass 20 for inductors having magnetostrictive structure.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 141 for underwater vibration transducers.

381, Electrical Audio Signal Processing Systems and Devices, subclasses 337+ for telephone transmitters and receivers with mechanical sound amplifying means (e.g., harmonic vibrators); and subclasses 190 and 355+ for telephone transmitters and receivers using magnetostrictive effects.

187 **Using bulk mode piezoelectric vibrator:**

This subclass is indented under subclass 186. Subject matter wherein the wave driven mechanical resonator is a piezoelectric body subject to changes in its transverse and/or longitudinal dimension(s) under the influence of an external electric field.

(1) Note. The dimensional deformations of the piezoelectric vibrator are accompanied by mechanical bulk wave mode resonances, such resonances may be of the transverse, longitudinal, sheer, radial, or plate mode type.

(2) Note. Excluded from this subclass are surface acoustic wave filters wherein mechanical deformation is realized substantially only along the free surface of a piezoelectric body and no significant bulk mode resonance effects are realized.

SEE OR SEARCH CLASS:

310, Electrical Generator or Motor Structure, subclass 323.19 for a piezoelectric element forming a resonant structure used to convert electric energy into sound energy or a piezoelectric element combined with specific means to conduct sound energy.

188 **With means for varying response:**

This subclass is indented under subclass 187. Subject matter wherein the filter bandwidth, center frequency, or phasing may be adjusted by mechanically or electrically variable parameters.

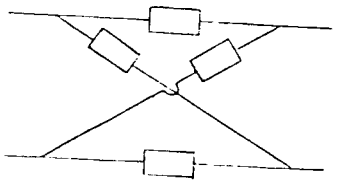
189 Plural coupled vibrators:
This subclass is indented under subclass 187. Subject matter wherein a plurality of vibrators are electrically or mechanically intercoupled so as to provide a composite response dependent on the contribution of each vibrator.

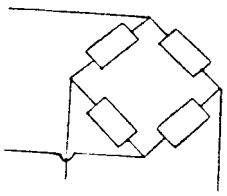
190 Lattice structure:
This subclass is indented under subclass 189. Subject matter having four circuit element branches connected in series to form a closed circuit, two nonadjacent junction points serving as input terminals while the remaining two junctions serve as output terminals.

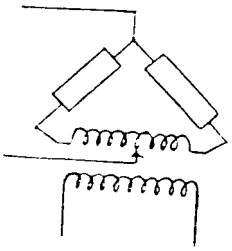
(1) Note. At least two of the circuit element branches include a piezoelectric vibrator.

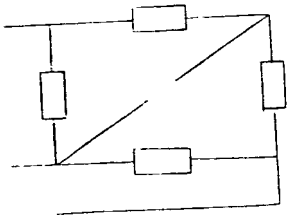
(2) Note. Two of the circuit branches may be formed by a transformer winding having a mid-tap, the mid-tap forming one of the input or output terminals, and the other winding of the transformer forming the output or input connecting means. See Fig. 4 below.

(3) Note. Included are for example:









191 Monolithic structure:
This subclass is indented under subclass 189. Subject matter wherein a plurality of coupled vibrators are formed on a common piezoelectric body.

192 With electrical coupling:
This subclass is indented under subclass 191. Subject matter wherein the vibrators include electrical intercoupling.

(1) Note. The vibrators may also include mechanical coupling.

193 Using surface acoustic waves:
This subclass is indented under subclass 186. Subject matter wherein mechanical wave energy within a desired frequency band is transmitted in the form of acoustic waves propagating principally along a free surface or a guiding substrate.

(1) Note. The substrate is usually piezoelectric or comprises a surface coated with material having piezoelectric properties.

(2) Note. The surface waves are excited by transducers having a desired frequency selectively.

194 Including spurious signal prevention or reduction means:
This subclass is indented under subclass 193. Subject matter including structure for minimizing undesired electrical or mechanical mode coupling.

195 With wave-modifying means (e.g., reflectors, resonators, diffractors, multistrip couplers, etc):
This subclass is indented under subclass 193. Subject matter including structure for modifying the amplitude, phase velocity, or propagation path of surface acoustic wave energy along the wave propagation path.

(1) Note. Included here are structures to establish surface acoustic wave resonance on selected portions of the propagation path.

196 With response weighting means:
This subclass is indented under subclass 193. Subject matter including significant structure for adjusting the amplitude and/or phase versus frequency transmission characteristics of the filters.

197 Plural mechanically coupled bar, plate or rod type resonating means:
This subclass is indented under subclass 186. Subject matter wherein plural mechanical vibrators structured in the form of bars, rods, or plates are mechanically intercoupled.

(1) Note. The individual vibrators may have the same or different periods of vibration.

198 Plural interresonator coupling paths:
This subclass is indented under subclass 197. Subject matter wherein some of the vibrators are coupled to each other along a plurality of mechanical wave coupling paths.

(1) Note. As an example, two rods or plates are intercoupled at more than one point (i.e., two end points of one vibrator are mechanically coupled to two end points of a second vibrator).

199 Plural mechanically coupled disk resonators:
This subclass is indented under subclass 197. Subject matter wherein plural disk-shaped vibrators are mechanically intercoupled.

200 Reed or fork-type resonators:
This subclass is indented under subclass 186. Subject matter wherein the vibrators are either elongated planar flexural mode structures having a relatively large ratio of length to width and thickness or are structured so as to resemble the tines of a fork.

201 Magnetostrictive wave transmission path:
This subclass is indented under subclass 186. Subject matter wherein mechanical wave energy is transmitted by a vibrator comprised of magnetostrictive material.

202 Wave filters including long line elements:
This subclass is indented under subclass 24. Subject matter including elements having distributed parameters and permitting free transmission of electric waves of a single frequency or band of frequencies (which may include zero frequency) while attenuating substantially electric waves having other frequencies, or attenuating substantially electric waves of a single frequency or band of frequencies (which may include zero frequency) while permitting free transmission of electric waves having other frequencies, and systems within the class definition which include such networks.

(1) Note. Tuners, which are closely analogous to the wave filters in the class, are classified in Class 334, Tuners. The tuners in Class 334 may include one or more long line elements in addition to a lumped inductance or capacitance element, or the tuner may consist of a distributed parameter type tuning unit which is adjusted in discrete, distinct steps. Two or more distributed parameter type tuner units which are of the continuously variable type and which are ganged together mechanically and/or electrically so as to have their mean resonant frequency adjusted in unison are properly classified in Class 334. Where only the bandwidth of the filter is varied without varying the means resonant fre-

quency, classification is in this class (333).

(2) Note. Filters combined with circuits having other functions classified in other classes are excluded and will be found in other classes. See the classes referred to under "Search Class" below. Note the exception in the case of a mere current and/or voltage control network combined with a filter in (4) Note.

(3) Note. Filters which include an active element are excluded. See Class 327, particularly subclasses 552+ where the active element is an electron tube or a transistor. Note that Class 327 includes some transversal filters.

(4) Note. Filters in combination with means merely to control the magnitude of the current and/or voltage in the network are included in this and the indented subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1+, for plural channel systems which include filters and for filters with plural input and/or output terminals.
19, for differentiating or integrating networks which are analogous to wave filters.
20, for wave shaping networks which are analogous to wave filters and which may include wave filters.
28, for equalizing networks which are analogous to wave filters.
100+, where the filter includes branching means (e.g., a single input with plural outputs).
126, for resonant filter networks for matching the impedance in branched circuits, and branched circuits with line sections analogous to wave filters for impedance matching purposes.
132+, for branched circuits which include filters.
156+, for delay networks having long line elements analogous to wave filters.
219+, for resonators.
236+, for long lines.
245+, for long line elements.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, particularly subclasses 552+ for unwanted signal suppression by an active filter which may utilize a transistor or an electron tube.
330, Amplifiers, subclasses 53+ for amplifier systems with long line element coupling means.
331, Oscillators, subclasses 96+ which include distributed parameters.

203 Digital structure:

This subclass is indented under subclass 202. Subject matter wherein the filter structure includes a plurality of electromagnetically coupled bar-or strip-type resonator sections aligned perpendicularly to the direction of wave propagation.

204 Stripline or microstrip:

This subclass is indented under subclass 202. Subject matter wherein the filter structure includes a long line of the type having planar conductors.

(1) Note. Examples of such lines are striplines, wherein a flat conductor is included between two ground planes, or microstrip lines, wherein a flat conductor coacts with a single ground plane.

205 Tunable:

This subclass is indented under subclass 204. Subject matter wherein the filter structure includes electrically or mechanically variable parameters to provide an adjustable amplitude versus frequency characteristic.

206 Coaxial:

This subclass is indented under subclass 101. Subject matter including a line structure comprising a conductor coaxially aligned with an outer cylindrical conductive sheath.

207 Tunable:

This subclass is indented under subclass 106. Subject matter wherein the filter structure includes electrically or mechanically variable parameters to provide an adjustable amplitude versus frequency characteristic.

208 Waveguide:
This subclass is indented under subclass 202. Subject matter wherein the filter structure includes a hollow dielectric tube, a hollow metal tube, or a solid dielectric designed to propagate electrical waves having an electric or magnetic field component extending in the direction of propagation and wherein the outer surfaces of the tube or solid dielectric serve as boundaries for the electromagnetic fields.

(1) Note. Included in this subclass would be filters employing dielectric rods or dielectric clad conductors wherein the propagation of energy is substantially confined to the immediate neighborhood of the rod or dielectric clad conductor.

209 Tunable:
This subclass is indented under subclass 208. Subject matter wherein the filter structure includes electrically or mechanically variable parameters to provide an adjustable amplitude versus frequency characteristic.

210 Including evanescent guide sections:
This subclass is indented under subclass 108. Subject matter wherein a waveguide section has reduced or negligible transmission due to the waveguide section being operated below its frequency cutoff point.

211 Including frequency selective absorbing means:
This subclass is indented under subclass 208. Subject matter wherein means are provided to dissipate or absorb wave energy of a given frequency or band of frequencies.

212 Including directly coupled resonant sections:
This subclass is indented under subclass 208. Subject matter wherein the filter structure includes resonant cavities directly coupled by slots or irises.

213 NEGATIVE RESISTANCE OR REACTANCE NETWORKS OF THE ACTIVE TYPE:
This subclass is indented under the class definition. Systems including active elements for producing, across at least two of the system terminals, a negative resistance and/or an inductance or capacitance which may be positive or negative.

(1) Note. This subclass does not include dynamoelectric machine systems which are used as a reactance element.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclasses 401+ for nonlinear reactance systems which may exhibit negative resistance characteristics.
323, Electricity: Power Supply or Regulation Systems, subclasses 212 through 219 for phase shift systems.
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for miscellaneous circuits utilizing negative resistance devices.
330, Amplifiers, subclasses 75+ for feedback amplifiers of the vacuum, tube type, particularly subclasses 82, 93, 101, 104, and 112 for positive feedback amplifiers; and subclasses 291+ for transistor feedback amplifiers.
331, Oscillators, subclasses 86+ for magnetron-type oscillators which may utilize negative resistance effects; subclass 115 for transistor oscillators of the negative resistance type; subclasses 126+ for oscillators utilizing the negative resistance characteristic of a gaseous space discharge; and subclasses 132+ for negative resistance or negative transconductance oscillators in general. Subclasses 1+ of Class 331 provide for automatic frequency stabilized oscillators many of which utilize adjustable reactance tubes, indented subclass 36 provides for particular frequency control means (e.g., reactance tubes, saturable inductors, etc.); and subclass 180 provides for oscillators in general including frequency adjusting means of the reactance tube type.
332, Modulators, particularly subclass 140 and 142+ for reactance tubes in frequency modulators, subclasses 147+ for reactance tubes in phase modula-

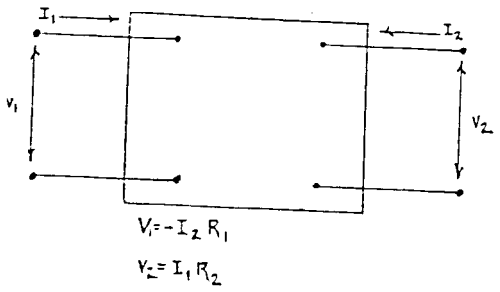
tors, and subclass 175 for reactance tubes in amplitude modulators.

334, Tuners, subclasses 14+ for tuners utilizing reactance tube networks.

214 Simulating specific type of reactance:
This subclass is indented under subclass 213. Subject matter wherein a positive-valued inductance or capacitance is produced.

215 Using gyrator:
This subclass is indented under subclass 214. Subject matter employing a nonreciprocal circuit of the type that produces at one point the positive inversion of the impedance at a second point (i.e., a positive impedance inverter).

(1) Note. GYRATOR: A gyrator is a four-terminal, two-port nonreciprocal network which may be defined as follows:



wherein R_1 and R_2 are transfer impedances whose product determines the gyration constant K.

216 Having negative impedance:
This subclass is indented under subclass 213. Subject matter wherein a negative-valued impedance is produced across two of the system terminals.

217 Providing negative resistance:
This subclass is indented under subclass 216. Subject matter wherein the negative impedance is a negative resistance.

218 FREQUENCY MULTIPLIERS:
This subclass is indented under the class definition. Subject matter wherein the device has a single input and single output and the frequency of the output wave is normally a whole number multiple of the input frequency.

(1) Note. The device must be a long line element and use a nonlinear solid-state device for multiplying.

219 RESONATORS (DISTRIBUTED PARAMETER TYPE):
This subclass is indented under the class definition. Devices comprising conductive enclosures, cavities, or wave transmission line sections of the two terminal types and having distributed inductance and capacitance, the line sections being terminated in other than the characteristic impedance of the line sections, the devices presenting resonant characteristics to the exciting source of wave energy, and systems within the class definition which include such devices.

(1) Note. This subclass includes resonators even if they are provided with tuning means and designated as tuners.

SEE OR SEARCH THIS CLASS, SUBCLASS:

245+, for long line elements which are terminated in other than their characteristic impedance and which are nonresonant, i.e., transmission line elements which are effectively inductances or capacitances, such as being 1/8 of a wave-length long.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclasses 4+ for cathode-ray tubes which have structurally combined therewith a resonant structure; subclasses 39+ for electronic tubes having structurally combined therewith a resonant transmission line; and subclasses 39.51+ and 40 for other electronic tubes which include resonant structures.

330, Amplifiers, subclasses 53+ for amplifiers having distributed parameter coupling which may be resonant; subclass 45 for electron beam type amplifiers having cavity resonator coupling means; subclass 49 for amplifiers wherein the active element is a tube

having distributed parameter characteristics which may be resonant.

331, Oscillators, subclass 5, 6+, 9, 79+, 86+, 93, and 96+ for oscillator systems utilizing distributed parameter resonators as an element thereof.

332, Modulators, particularly subclasses 129+ for resonators in frequency modulators and subclasses 163+ for resonators in amplitude modulators.

343, Communications: Radio Wave Antennas, subclass 723 for single adjustable length electrically long linear antennas; subclasses 745+ for antennas with a variable reactance for tuning the antenna; subclasses 746 and 767+ for slot-type antennas which may include resonator structure; subclasses 790+ for sleeve-type antennas; subclasses 793+ for balanced doublet-type antennas which may have resonant characteristics; subclasses 825+ for fractional, multiple, or full wavelength-type antennas; and subclass 843 for antennas having an appreciable wave-length dimension.

455, Telecommunications, subclasses 130+ for radio receivers using resonators, see particularly subclasses 325+ for frequency conversion means with distributed parameter elements which may be resonant.

219.1 Dielectric type:
This subclass is indented under subclass 219. Subject matter where the resonator device is a dielectric material body in which field configurations excited by the source of wave energy are substantially confined therein.

219.2 Magnetic type:
This subclass is indented under subclass 219. Subject matter where the resonator device possesses magnetic properties responsive to the exciting source of wave energy.

220 Open wire or lecher line:
This subclass is indented under subclass 219. Subject matter wherein the line section is of the parallel wire type normally an integral number of half-wavelengths long so as to set up standing waves on the section.

221 With tuning:
This subclass is indented under subclass 220. Subject matter wherein the resonator has means which can be adjusted to resonate or operate at a specified frequency.

222 Coaxial or shielded:
This subclass is indented under subclass 219. Subject matter wherein the resonator is of the two conductor type having a central conductor concentric with the resonator outer conductor.

223 With tuning:
This subclass is indented under subclass 222. Subject matter wherein the resonator has means which can be adjusted to resonate or operate at a specified frequency.

224 Having movable element:
This subclass is indented under subclass 223. Subject matter wherein the frequency is adjusted by a movable element.

225 Using movable shorting means:
This subclass is indented under subclass 224. Subject matter wherein short-circuiting means is included with the coaxial or shielded transmission line.

226 Using plunger, rod, or piston:
This subclass is indented under subclass 224. Subject matter wherein the movable element is a plunger, rod, or piston.

227 Cavity resonator:
This subclass is indented under subclass 219. Devices and systems where the resonator device is an enclosure or cavity so constructed that the field configuration excited within the boundaries of the device includes longitudinal as well as transverse field components.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclasses 5+ for cathode-ray tubes which have structurally combined therewith a hollow resonant structure (e.g., waveguide hollow resonator); subclasses 39+ for electronic tubes structurally combined with a waveguide section; and subclasses 39.51+ and 40 for other electronic tubes structurally combined

with resonator structure (e.g., magnetrons).

330, Amplifiers, subclass 45 for electron beam tube amplifiers coupled to a cavity resonator; and subclass 56 for amplifiers, generally having a resonator of the waveguide, cavity, or concentric line type.

331, Oscillators, subclass 5, 6+, 81+, 86+, 93, and 96 for oscillator systems utilizing distributed parameter resonators, which resonators may be of the cavity or hollow waveguide type.

332, Modulators, particularly subclasses 129+ for resonators in frequency modulators and subclasses 163+ for resonators in amplitude modulators.

343, Communications: Radio Wave Antennas, subclass 762 and 772+ for waveguide-type antennas; and subclass 771 for plural slot-type antennas with waveguide coupling.

228 With mode suppressor:
This subclass is indented under subclass 227. Subject matter wherein means are provided to minimize or substantially eliminate extraneous modes of oscillation in cavity resonators.

229 With temperature compensation:
This subclass is indented under subclass 227. Subject matter wherein the cavity resonator has thermal compensation means to substantially reduce the effects of temperature variations on the operating frequency.

230 With coupling:
This subclass is indented under subclass 227. Subject matter wherein significant structure is included for effecting the transfer of oscillatory energy between the cavity resonator and another circuit.

231 With tuning:
This subclass is indented under subclass 227. Subject matter wherein the cavity has means whereby the cavity can be adjusted to resonate or operate at a specified frequency.

232 Having movable element:
This subclass is indented under subclass 231. Subject matter wherein the frequency is adjusted by a movable element.

233 Using movable wall:
This subclass is indented under subclass 232. Subject matter wherein the movable element is a wall that moves or is flexible.

234 Temperature compensated:
This subclass is indented under subclass 219. Subject matter wherein the resonator has thermal compensation means to substantially reduce the effects of temperature variations on the operating frequency.

235 With tuning:
This subclass is indented under subclass 219. Subject matter wherein the cavity of the resonator has means which can be adjusted to resonate or operate at a specific frequency.

236 LONG LINES:
This subclass is indented under the class definition. Structure providing a single channel of indefinite length for conveying and guiding wave energy, and having distributed electrical parameters so related or proportioned as to determine the wave propagating characteristics of the channel.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12, for long lines with means to eliminate interference currents therein or with means to minimize radiation therefrom.

22, for dissipative terminations for transmission lines.

23, for artificial lines simulating a transmission line.

26, for coupling networks for connecting balanced to unbalanced circuits or vice versa which include a long line element.

27, for transmission lines with coupling networks at the opposed ends.

33+, for impedance matching networks which include a long line element.

202+, for filters which include a long line element.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, appropriate subclasses for conductor structure other than loaded

lines and lines defined as having long line characteristics; see subclass 27 and 113+ for parallel or twisted conductor structures; subclasses 28 and 102+ for coaxial and shielded cable structure; subclasses 32+ for anti-inductive conductor structures; subclasses 37+ for underground conductor structures; and subclasses 40+ for overhead conductor structures.

178, Telegraphy, for telegraph transmission line systems; and particularly subclasses 45+ for loaded circuits; subclass 63 for long cable systems; and subclass 69 for line-clearing and circuit-maintenance systems.

307, Electrical Transmission or Interconnection Systems, appropriate subclasses, particularly subclass 146 and 147+ for miscellaneous systems of distribution with transmission lines usually of the electrically short type.

315, Electric Lamp and Discharge Devices: Systems, subclasses 3.5+ and 4+ for transmission line sections structurally combined with cathode-ray tubes; and subclasses 39+ for electronic tubes which are structurally combined with a transmission line of the distributed parameter type.

324, Electricity: Measuring and Testing, subclasses 51+, 54, 66+, 95, and 600+ for arrangements to determine the electrical characteristics of transmission lines.

329, Demodulators, subclass 322 for a frequency demodulator including distributed parameter structure and subclass 354 for an amplitude demodulator including distributed parameter structure.

330, Amplifiers, subclasses 53+ for amplifiers coupled to a long line.

340, Communications: Electrical, for miscellaneous electrical signaling systems which include a long line. Note subclasses 310.01+ for such systems where the signal is transmitted over a power line; and subclass 320 for signaling using a fluid conduit to transmit the signal.

343, Communications: Radio Wave Antennas, subclasses 700+ for antennas which may involve long lines.

379, Telephonic Communications, for telephone transmission line systems; particularly subclasses 1.01 through 33 for long line testing device, subclasses 90.01-108.02 for composite systems (e.g., telegraph and telephone), and subclass 398 for anti-inductive systems.

237 Leaky lines:

This subclass is indented under subclass 236. Subject matter wherein the long line carries a travelling wave which is lightly coupled to a series of leakage apertures to create a concentrated, uniform, radiation field in the immediate vicinity of the aperture.

(1) Note. Many of the patents in this subclass are directed towards radiating energy from a coaxial cable in a building, tunnel, or mine and/or for vehicle communication.

SEE OR SEARCH CLASS:

343, Communications: Radio Wave Antennas, subclasses 700+ for the structural details of the radiating aperture used in conjunction with the long line, e.g., subclasses 767+ for slots.

238 Strip type:

This subclass is indented under subclass 236. Subject matter wherein the long line is of the type having planar conductors.

(1) Note. Examples of such lines are stripline, microstrip, slot line, and coplanar waveguide.

239 Waveguide type:

This subclass is indented under subclass 236. Subject matter particularly adapted for propagating electric waves having an electric or magnetic field component extending in the direction of propagation.

(1) Note. The waveguide may be a hollow dielectric or metal tube or solid dielectric rod, the wave energy being propagated along the interior of the tube or rod and confined by the walls of the tube or rod.

240 Surface wave:

This subclass is indented under subclass 239. Subject matter for propagating, without substantial radiation, electromagnetic energy along the interface between two media having different physical properties (e.g., different permittivities).

(1) Note. While the electromagnetic field extends to infinity in a direction transverse to the guide, the energy density decreases with distance so that most of the energy propagation is in the immediate neighborhood of the interface.

(2) Note. Surface wave guiding structures may comprise dielectric clad conductive cylinders, conductive planes with parallel grooves or conductive cylinders with radial grooves, or a dielectric rod clad with a dielectric media of a different permittivity.

241 Flexible:

This subclass is indented under subclass 239. Subject matter wherein the waveguide is articulated, segmented, or otherwise structured so as to permit desired bending without appreciable wave mode distortion and/or without appreciable characteristic impedance variation.

242 Circular or helical structure:

This subclass is indented under subclass 239. Subject matter wherein the guide structure is a hollow conductive cylinder, a helical conductor, or a helical conductor located within a conductive screen.

243 Shielded type:

This subclass is indented under subclass 236. Subject matter wherein the long line comprises at least one electrical conductor surrounded by an electrically conducting screen.

(1) Note. This subclass includes, for example, coaxial cable-type conductors and other transmission lines having one or more conductors surrounded by an outer metal sheath which is designed for use as a conductor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12, for interference suppression and/or elimination systems which may include electrical screens or shields, and for conductor arrangements which involve shielding means or structure in addition to the conductor arrangement.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, particularly subclasses 28+ for the structure of coaxial or concentric-type cables having a fluid or vacuum; subclass 36 for electrically shielded or screened conductors; and subclasses 102+ for cables or conductor structure having a conductive armor or sheath.

315, Electric Lamp and Discharge Devices: Systems, subclasses 4+ for cathode-ray tubes which have structurally combined therewith a coaxial cable section; and subclasses 39+ for other electronic tubes which have structurally combined therewith a coaxial cable section.

343, Communications: Radio Wave Antennas, subclasses 841+ for antennas with an electrical shield; subclass 851 for antennas with a coupling network including a radiation suppressor; and subclass 905 for antennas combined with a transmission line which may include a shield for the transmission line.

244 Including spaced, electrically compensated, internal support means:

This subclass is indented under subclass 243. Subject matter having spaced apart support means for an internal conductor, wherein the support means and/or ancillary reactance means function to reduce the effects of impedance discontinuities normally resulting from the use of a discontinuous support structure.

245 LONG LINE ELEMENTS AND COMPONENTS:

This subclass is indented under the class definition. Components and elements not constituting a complete network which are limited by claimed structure to use in long lines and which

are not otherwise classified, and also long line elements.

(1) Note. Included in this subclass are structures and devices for modifying the characteristics of a transmission line at a particular location, for example, line short-circuiting switches, line-shorting plugs, impedance elements, and long line elements which are terminated in other than their characteristic impedance and are nonresonant (e.g., a short-circuited line 1/8 of a wavelength long).

SEE OR SEARCH THIS CLASS, SUBCLASS:

13, for resonator type breakdown discharge device networks for short circuiting a long line.
22, for dissipating terminations for long lines.
101+, for branched circuits having switching means.
219+, for resonators.
236+, for long lines.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, appropriate subclasses for conductors, housing insulators, conductor joints, and end structure where no significant wave propagation characteristic limiting the structures to use with long lines is claimed.
200, Electricity: Circuit Makers and Breakers, appropriate subclasses for switching structure in general.
285, Pipe Joints or Couplings, appropriate subclasses for couplings for coaxial lines or for waveguides where no significant electrical features are claimed.
329, Demodulators, subclass 322 for a frequency demodulator including distributed parameter structure and subclass 354 for an amplitude demodulator including distributed parameter structure.
330, Amplifiers, subclasses 53+ for amplifiers with distributed parameter coupling means including subject matter involving structural details of such means.
343, Communications: Radio Wave, subclasses 907+ for antenna components.
439, Electrical Connectors, for transmission line electrical connectors where no significant wave propagation characteristic are claimed which limit the structure to use with long lines.

246 Strip type:

This subclass is indented under subclass 245. Subject matter wherein the long line is of the type having planar conductors.

(1) Note. Examples of such lines are stripline (two ground planes), microstrip (one ground plane), slot lines, or coplanar waveguides.

SEE OR SEARCH THIS CLASS, SUBCLASS:

238, for strip-type lines, per se.

247 Semiconductor mounts:

This subclass is indented under subclass 246. Subject matter wherein a strip-type board is used to hold or support a solid-state device such as a transistor.

SEE OR SEARCH CLASS:

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 662 through 664.

248 Waveguide elements and components:

This subclass is indented under subclass 245. Components and elements which are limited to use with waveguides, and also waveguide elements.

(1) Note. A waveguide may be a hollow dielectric or metal tube or a solid dielectric rod, the wave energy being propagated along the interior of the tube or rod and confined by the walls of the tube or rod.

SEE OR SEARCH THIS CLASS, SUBCLASS:

113, for directional couplers having parallel-guide waveguides.
114, for directional couplers having crossed-guide waveguides.
122, for hybrid-type networks using waveguide.

135, for frequency separation utilizing long line elements including waveguide elements.
157+, for delay lines including long line waveguide elements.
239+, for types of waveguide.

SEE OR SEARCH CLASS:
138, Pipes and Tubular Conduits, subclasses 100 through 178 for waveguide structures and accessories which are not limited to electrical use.
174, Electricity: Conductors and Insulators, appropriate subclasses for conduits and transmission line structure limited to electrical use but not having long line characteristics.
285, Pipe Joints or Couplings, appropriate subclasses for pipe couplings not limited to electrical use.
329, Demodulators, subclass 322 for a frequency demodulator including distributed parameter structure and subclass 354 for an amplitude demodulator including distributed parameter structure.
343, Communications: Radio Wave Antennas, subclass 783 for waveguide-type antennas with internal wave refraction means; and subclass 785 for waveguide-type antennas which are of the dielectric type.

249 Bend:
This subclass is indented under subclass 248. Subject matter wherein the longitudinal axis of the waveguide element changes direction.

250 Active element mounting:
This subclass is indented under subclass 248. Subject matter wherein the waveguide element is designed to support an active element (e.g., diode, tube) in the waveguide.

251 Mode suppressor:
This subclass is indented under subclass 248. Subject matter wherein the waveguide is designed to pass a desired electromagnetic mode or modes and block or filter out any undesired electromagnetic mode or modes.

252 Window:
This subclass is indented under subclass 248. Subject matter wherein the waveguide element contains an electromagnetic wave-permeable solid plate lying transverse to the direction of wave propagation.

253 Including variable impedance:
This subclass is indented under subclass 248. Subject matter wherein structure is provided in the waveguide to adjust the impedance (normally the reactive portion) of the line at selected terminal planes.

(1) Note. Movable shorting stubs and movable irises are classified here.

SEE OR SEARCH THIS CLASS, SUBCLASS:
33+, for impedance matching between networks.

254 Connectors and interconnections:
This subclass is indented under subclass 248. Subject matter having means for joining separate waveguide sections.

255 Quick disconnect:
This subclass is indented under subclass 254. Subject matter wherein the joined waveguides are provided with means to rapidly connect and disconnect the waveguides.

256 Movable:
This subclass is indented under subclass 254. Subject matter including structure which allows relative movement between the joined waveguides during normal operation.

257 In line:
This subclass is indented under subclass 256. Subject matter wherein the axes of the joined waveguide sections are aligned.

258 Switch:
This subclass is indented under subclass 248. Subject matter wherein wave energy is selectively passed along the waveguide by a means which abruptly connects and disconnects a single waveguide input from a single waveguide output.

SEE OR SEARCH THIS CLASS, SUBCLASS:
101+, for switches in branched circuits.

259 Mechanically movable:
This subclass is indented under subclass 258. Subject matter wherein the connecting and disconnecting is accomplished using mechanically actuated means.

(1) Note. The mechanically actuated means may be a movable vane or movable shorting pins.

SEE OR SEARCH THIS CLASS, SUBCLASS:
105+, for mechanical switches in branched circuits.

260 Connectors and interconnections:
This subclass is indented under subclass 245. Subject matter having means for joining separate long line sections.

261 Rotary coupling:
This subclass is indented under subclass 260. Subject matter having means to provide relative rotation between two intercoupled long line sections.

262 Switch:
This subclass is indented under subclass 245. Subject matter wherein energy is selectively passed along the long line by abruptly connecting and disconnecting a single line input from a single line output.

263 Including variable impedance:
This subclass is indented under subclass 245. Subject matter wherein means are connected to the long line to adjust the impedance (normally the reactive portion) of the line at selected terminal planes.

(1) Note. Movable short circuits and variable reactances are classified here.

END